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VALLEAU (W. D.). **Tobacco ring spot virus: the cause of Eggplant yellows.**—*Phytopathology*, 41, 3, pp. 209–212, 1951.

Transmission studies at the Kentucky Agricultural Experiment Station proved that yellowed eggplants contained tobacco ring spot virus [*R.A.M.*, 8, p. 139], which produced typical ring spot symptoms and caused pollen sterility in Burley tobacco. Although yellowing did not develop in greenhouse eggplants inoculated with two strains of the virus, they were systemically infected and the virus was recovered from crushed leaf tissues. Light conditions during the experiments may have been responsible for the absence of yellows symptoms. The lack of ring patterns suggests that eggplants may be more susceptible to the virus than tobacco and several other plants which develop chlorotic and necrotic rings. The disease in eggplant, however, is very similar to that in tobacco, potato, and *Solanum carolinense* in the chronic or so-called recovered stage, when ring patterns are no longer produced, but certain strains of the virus cause typical yellows. Partial pollen sterility occurs in eggplants infected by ring spot. The insect vector of the ring spot virus remains unknown, but sulphur dusting controls eggplant yellows [ibid., 22, p. 465] and drives *Thrips tabaci* from tobacco plants. These insects are abundant on tobacco at the time of infection by ring spot.

BONNEMAISON (L.). **Observations biologiques sur le puceron gris du Pêcher (Myzus persicae Sulz.) et le puceron noir (Aphis fabae Scop.) en relation avec la transmission des maladies à virus de la Pomme de Terre et de la Betterave.** [Biological observations on the grey Peach aphid (*Myzus persicae* Sulz.) and the black aphid (*Aphis fabae* Scop.) in relation to the transmission of virus diseases of Potato and Beet.]—*C.R. Acad. Agric. Fr.*, 36, 13, pp. 525–527, 1950.

From observations of the seasonal cycles of *Myzus persicae* and *Aphis fabae* [see next abstract] it appears that in France the first migrants of the former which have wintered on spinach may carry beet mosaic virus, while *M. persicae* and *A. fabae* individuals which have wintered in beet silos may shortly after transmit beet mosaic and beet yellows viruses. Early transmission of viruses may also be effected by insects which have developed in glasshouses on plants susceptible to potato or beet viruses [cf. *R.A.M.*, 30, p. 241]. At Versailles in 1947 populations of *A. fabae* on beet seed plants increased very rapidly at the end of May and the beginning of June, while the numbers of *M. persicae* on beet and potato were at their maximum after 21st June.

BONNEMAISON (L.). **Diverses méthodes de protection des plantes cultivées contre les maladies à virus.** [Different methods of protecting cultivated plants against virus diseases.]—*C.R. Acad. Agric. Fr.*, 36, 13, pp. 527–529, 1950.

Notes are given on protecting crops from virus diseases transmitted by *Myzus*

persicae and *Aphis fabae* [see preceding abstract]. When the daytime temperature reaches 10° C. beets should not be left lying about near the clamps, which should not be used after the end of March [cf. *R.A.M.*, 30, p. 209]. 'Screens' [cf. ibid., 30, p. 399] should be at right angles to the prevailing winds; they should not harbour the insects, should bear a dense foliage up to the time potatoes are lifted or to the end of September for beets, and should be of sufficient height to keep the insects out by the second half of June for *A. fabae* and by the second ten days in July for *M. persicae*. 'Screens' should not be used for crops that are being multiplied unless it has been proved that they conduce to a greater and healthier yield. Beets sown [in France] at the end of June or in the first fortnight of July run little risk of infection from winged insects coming from seed-bearers.

Ferguson (I. A. C.). **Four virus diseases of solanaceous plants in Trinidad.**—*Plant Dis. Reptr*, 35, 2, pp. 102–105, 1951. [Multilithed.]

Descriptions are given of four virus diseases of solanaceous plants new to Trinidad, provisionally named tomato twisted leaf, tomato bronze leaf [*R.A.M.*, 30, p. 348], eggplant mosaic [ibid., 28, p. 161], and [chilli] pepper mosaic [ibid., 28, p. 505].

Tomato twisted leaf commonly appears in a crop shortly after transplanting; the disease is characterized by marked stunting and a downward twisting of the leaves. Leaflets are reduced in size and the expanding ones may show pronounced yellow vein-clearing. Ponderosa tomato also developed veinal necrosis, but this symptom was only slight in other varieties. After several days infected plants tend to recover and normal height may be attained, but the leaves remain smaller than those of healthy plants and show interveinal chlorosis. The symptoms vary considerably even on plants of the same variety. In the glasshouse the most striking symptom is the chlorotic pattern on the leaves. Infected plants bear fewer and slightly smaller fruits. The disease was readily transmitted by grafting, the first symptoms appearing after one to two weeks, but not by sap inoculation. In chilli it caused leaf-mottling six days after grafting, some yellowing along the veins, leaf-puckering, and in some cases leaf-blistering. No symptoms developed in eggplant, *Nicotiana glutinosa*, or tobacco.

Tomato plants grown in greenhouses often become infected with bronze leaf and occasional outbreaks have also been observed in the field. On Marglobe slight bronzing of the young leaves soon becomes more severe. The leaves remain small and become leathery. The growth of the plant is much retarded and necrosis accompanied by die-back often occurs, resulting ultimately in the death of the plant. The disease was readily transmitted by grafting to Black Beauty eggplant (chlorosis and stunting), Fordhook chilli (mottling, yellowing along the veins, and interveinal chlorosis), White Burley tobacco (leaf mottle with yellow interveinal chlorosis in older plants), and *N. glutinosa* (mottling and puckering of young leaves). Rubbing with the freshly expressed infective sap also transmitted the virus. White flies (Aleyrodidae), which are often present in the greenhouses, are suspected to be the vectors of tomato bronze leaf, plants secluded from insects being free from the disease.

Eggplant mosaic is common, but causes little damage to the imported Black Beauty or the local hybrids. The virus was readily transmitted by sap inoculation to tomato and *Lycopersicon pimpinellifolium*, inducing in both hosts a temporary growth retardation followed by leaf crinkling and mottling; Arran Pilot potato developed mottling and chlorotic leaf lesions, which became necrotic; chilli produced sparse, irregular chlorotic lesions; and *N. glutinosa* circular, necrotic leaf lesions followed by chlorotic ring spots, stunting, especially in seedlings, mottle, wavy leaf margins, and veinbanding in some cases. Tobacco and various *N.* species, cucumber, and vegetable marrow were also susceptible.

Pepper mosaic, the symptoms of which differ from that caused by tobacco mosaic virus [ibid., 23, p. 203], but are strikingly similar to those reported from Puerto Rico [ibid., 21, p. 401], is prevalent in the field. Fruit disfiguration is more marked in sweet peppers (*Capsicum annum* var. *grossum*) than in hot (var. *minimum*). Perennial 'bird' peppers and 'cherry' peppers (*C. frutescens*) are also frequently infected. Cross-inoculation experiments showed that the same virus is responsible. Inoculation (by rubbing) resulted in infection of White Burley tobacco, *N. tabacum* var. *macrophylla*, and *N. chinensis*. Tomato, eggplant, cowpea, *N. glutinosa*, *N. rustica*, and *N. sylvestris* were immune [cf. ibid., 26, p. 214].

The heat inactivation of eggplant mosaic, tomato bronze leaf, and pepper mosaic viruses took place at 65° C., 40°, and 62°, respectively; dilution tolerance was 1 in 10,000, 1 in 2,000, and 1 in 5,000, respectively; and longevity *in vitro* three weeks at 15°, 85 minutes at room temperature, and 16 days at 15°, respectively. None of these viruses conferred immunity from the others.

Miller (P. R.) & O'Brien (Muriel). **The plant disease warning service in 1950.**—*Plant Dis. Reptr, Suppl.* 197, pp. 559–572, 13 maps, 1950. [Multilithed.]

The diseases under consideration in the Crop Plant Disease Forecasting Programme covering part of Canada and the United States [cf. *R.A.M.*, 29, p. 203], namely, potato and tomato blight (*Phytophthora infestans*), tobacco blue mould (*Peronospora tabacina*) [ibid., 29, p. 436], and cucurbit downy mildew (*Pseudoperonospora cubensis*), were quite prevalent during 1950. Owing to the extremely favourable, cool, wet summer over most of the plant-growing area tomato blight attained the most widespread distribution ever recorded in the United States, with severity and loss equalling or possibly exceeding those of the 1946 outbreak, yield reductions amounting to 95 per cent. in some cases. The disease was reported for the first time in Arkansas, Missouri, Iowa, and Nebraska. Dithane, dithane Z–78, dithane D–14, parzate, fixed and insoluble coppers, Bordeaux mixture, nabam plus zinc sulphate, basic copper sulphate, zineb, tribasic copper, copper-lime, and split schedule ziram and Bordeaux gave excellent or good results when applied under favourable spraying and dusting conditions. Untreated fields were often completely destroyed.

Although causing less economic loss than on tomato, potato blight was widespread in the Atlantic Coast seaboard States and in Ontario, Quebec, New Brunswick, and Nova Scotia. Yield reductions mostly did not exceed 10 per cent., although they amounted to 100 per cent. in some areas in Pennsylvania. In general, spraying and dusting, together with local dry weather conditions, prevented local epidemics and kept the disease in check, excellent control in some areas being secured with Bordeaux mixture, dithane D–14 and Z–78, nabam plus zinc sulphate, zineb, and tribasic copper sulphate.

Blue mould occurred generally throughout the tobacco growing areas but was relatively mild on the whole, this being due partly to warm, dry weather in the southern Atlantic States in February and to the thoroughness and effectiveness of the control measures. On the whole, growers secured the best control with fermate and favoured dusting rather than spraying.

Cucurbit downy mildew was more active on the watermelon crop than heretofore, probably owing to the early and abundant build-up and distribution of inoculum on this crop. Losses were less, however, since the disease appeared when the crop was mature or nearing maturity. Reports indicated that *P. cubensis* can be controlled by a spray schedule, carbamates probably offering the best control. Copper fungicides appeared to be injurious.

The details of spray programmes used and the general results obtained are tabulated.

Annual Report of the Agricultural Experiment Stations, Florida, for the year ending June 30, 1949.—333 pp., 14 figs., 3 graphs, [? 1950].

In this report [cf. *R.A.M.*, 29, p. 86] W. B. TISDALE (p. 113) states that in further laboratory tests all *Trichoderma* isolates from blueberry [*Vaccinium*], boxwood, and *Camellia* grew over *Rhizoctonia* isolates from damped-off vegetable seedlings and appeared to be weakly parasitic on them. One bacterial isolate displayed antagonism. Lettuce seed emergence was 79·6 per cent. in soil free from vegetation [green manure] and organisms, 22·6 per cent. in soil containing a pure culture of *Rhizoctonia*, and 0 per cent. with vegetation alone or in combination with organisms. *Trichoderma* and *Rhizoctonia* were isolated from dead seed that had failed to germinate in the treated soil. Cabbage seed sown in treated soil was reduced in germination by *Rhizoctonia* alone and inhibited by vegetation alone or in combination with the other organisms ten and 80 days after the original treatments.

In further breeding work with eggplants for resistance to fruit rot and blight (*Phomopsis*) [*vexans*] P. DECKER found that the yields of marketable fruit from eight hybrid selections in a replicated autumn planting were three to eight times as high as those of three standard varieties. Blight was not present in the seed but appeared on stems and leaves of susceptible plants soon after transplanting and later spread rapidly; only the resistant hybrids continued to produce marketable fruit. Hybrid 687–3, to be named Florida Market, when grown in 12 localities performed at least as well as the standard varieties in the absence of blight, and yields were unaffected by its presence. Seed of this hybrid and 655–1 (Florida Beauty) is to be released.

E. WEST reports that over one-quarter of the 96 specimens of diseased *Camellia* received from Florida [ibid., 30, p. 108] and 17 from other southern States during the year bore scab (*Sphaceloma* sp.). Root rot (*Phytophthora cinnamomi*), not previously reported in the State, was found on *C. japonica* and *C. sasanqua*, the latter a new host.

P. DECKER states that poor lupin stands and subsequent loss of seedlings were caused by dry weather favouring *Rhizoctonia* and *Sclerotium rolfsii* [ibid., 28, p. 327]. During the winter and spring of 1948–9 there was a severe outbreak of brown spot (*Ceratophorum setosum*) [ibid., 29, p. 87, and below, p. 470], which was present on all seedlings of 1947–8 selections in the nursery at Quincy, and an epidemic of anthracnose (*Glomerella cingulata*) [loc. cit.]. A positive correlation was established between early maturity and reduced anthracnose infection on selections. Seed from blocks with the least anthracnose in 1948 was sown that year and, although the disease was present on all plants, gave a much heavier seed crop in 1949 than the average of the commercial fields in the area. Lupin should not follow lupin, especially when brown spot is severe and the crop is saved for seed.

J. R. LARGE reports that the recommended spray programme of four applications of Bordeaux mixture at intervals of three weeks during spring and summer failed to control pecan scab [*Cladosporium effusum*: ibid., 28, p. 602] because of excessive rain.

Against downy mildew (*Peronospora parasitica*: ibid., 28, p. 368] on heading cabbages and seedlings A. H. EDDINS (p. 134) found that spergon wettable spray (4 lb. per 100 gals.) gave slightly better control than 12 per cent. spergon dust, only 1 per cent. of the seedling foliage and 0·6 of the heads being affected. Approximately one-third of the untreated seedlings were destroyed by the disease and the rest severely stunted; 11·2 per cent. of the untreated cabbages were unsaleable.

The best control of *Alternaria* curd spot of cauliflower (*A. oleracea*) [*A. brassicicola*: ibid., 29, p. 87] was given by spraying with dithane D–14 plus zinc sulphate, resulting in 11·7 unsaleable heads, parzate plus zinc sulphate 12·2 (both at 2 quarts plus 1 lb. to 100 gals.), and tribasic copper-zinc (7 lb.) 13·7, compared with 31·2 for the unsprayed. On heading cabbage the parzate combination spray gave

better control than 6·5 per cent. parzate dust, 11·7 and 33·1 per cent., respectively, being unsaleable, as against 39·9 per cent. of the untreated. Sprayed plants gave 5·1 tons more saleable cabbage per acre than dusted, and 5·9 tons more than untreated plants.

Black rot (*Xanthomonas campestris*) [ibid., 30, p. 255] remained one of the most prevalent and destructive diseases of cabbage and cauliflower in the Sanford and Hastings areas. Only 8 per cent. of 240 plants grown from hot-water-treated seed became affected in infested soil. Ninety-eight per cent. of Georgia-grown cabbage plants set in a 10-acre field in 1948 developed the disease, which affected only 7 per cent. of home-grown plants set in the same field in 1949. Cabbage yellows (*Fusarium oxysporum* f. *conglutinans*) [*F. conglutinans*: ibid., 28, p. 445; 29, p. 109] was observed in the Hastings area for the first time in November, 1948, in 27 fields comprising about 313 acres.

J. M. Walter, J. R. Beckenbach, and D. G. A. Kelbert report (p. 146) that the newly released tomato varieties Manasota and Manahill are highly resistant to *Fusarium* wilt [*F. bulbigenum* var. *lycopersici*: loc. cit.], though the former is somewhat susceptible to blossom-end rot, while the latter is also highly resistant to *A. solani* and *Stemphylium solani*. Early tomato plants, which had been allowed to recover from damage caused by excessive rain, and which bore a light sprinkle of fungus leaf spots (*S. solani*, *A. solani*, and *Phoma destructiva*), were power-sprayed when some fruits were nearly mature at weekly intervals from 4th November with various new fungicides. The average defoliation on 22nd December indicated that sodium parzate liquid plus zinc sulphate (2 qts., ¾ lb., 100 gals.) had been as fungicidal as dithane D–14 plus zinc sulphate (2 qts., ¾ lb., 100 gals.), registering 30 and 25 per cent. respectively, compared with 98 per cent. for the unsprayed. J. M. Walter (p. 765) reports a case of *S. solani* [ibid., 29, p. 540] being carried to a new tomato crop by way of the old dried plants clinging to the stakes. Cucumbers of the 1948 autumn crop in the Wauchula area were severely damaged by mosaic [cf. ibid., 28, p. 504]. Tobacco mosaic virus was unusually prevalent and severe on the spring 1949 tomato crop in the Ruskin area. It was confirmed by tests with *Gomphrena globosa* that the tomato virus collection of 1947 tentatively labelled 'streak' was mixed streak (tobacco mosaic virus plus potato virus X) [ibid., 29, p. 202], the specific spot reaction of the latter virus being produced on amaranth [*Amaranthus* sp.] leaves [ibid., 24, p. 244] and that of tobacco mosaic virus on N N Burley. Wettable sulphur (16 lb. per 100 gals.), dithane D–14 plus zinc sulphate, calcium parzate plus zinc sulphate, phygon XL (1 lb. per 100 gals.), and SR 406 (4 lb. per 100 gals.) in one test appeared to have some value against pole bean [*Phaseolus vulgaris*] rust [*Uromyces appendiculatus*: cf. ibid., 29, pp. 471, 497].

R. O. Magie states (p. 160) that *Curvularia* disease of *Gladiolus* [*C. lunata*: ibid. 27, p. 525; 29, p. 414] was generally present on unsprayed susceptible varieties.

In work by G. K. Parris (p. 169) good progress is being made towards the development of a Cannon Ball watermelon resistant to *Fusarium oxysporum* [*F. bulbigenum*] var. *niveum* [ibid., 27, p. 592; 29, p. 74; 30, p. 311].

In fungicide tests on a golden type of celery against *Cercospora* blight [*C. apii*: ibid., 29, p. 88] J. W. Wilson secured significantly lower infection with nabam than with neutral copper or ferbam plus ziram, but the last-named combination with DDT emulsion resulted in the largest amount of marketable celery. Pink rot (*Sclerotinia sclerotiorum*) [ibid., 30, p. 207] was very much more prevalent in plots treated with nabam than in those treated with ferbam plus ziram or neutral copper.

R. R. Kincaid (p. 226) observed that the percentage of cigar-wrapper tobacco plants affected by veinbanding [cf. ibid., 24, p. 76; 27, p. 201] in experimental plots was highest near plots not treated for the control of *Myzus persicae* and heavily

infested with the aphids, and became steadily lower with increasing distance away. This spread occurred in treated plots in spite of aphicide applications. It is tentatively concluded that aphids were able to transmit the disease to a treated plant before they succumbed to the aphicide. The disease was not readily transmitted by handling.

In a field spraying test by G. D. Ruehle (p. 249) to control blight [*Phytophthora infestans*] on Bliss Triumph potatoes the copper salt of thiram and experimental fungicide SR 406 showed promise (52 and 47 per cent. increased yield, respectively). Dithane plus zinc sulphate (the latter at 1 lb. and ¾ lb. per 100 gals.) gave 38 and 31 per cent. increased yield, respectively [see preceding abstract], while parzate liquid and magnesium ethylene bisdithiocarbamate gave similar results. An exploratory test indicated that phygon XL is a very promising fungicide for preventing potato seed piece decay caused by a species of *Fusarium*.

R. A. Conover and G. D. Ruehle found that 5 per cent. 2-amino-pyridine (1-minute dip) appeared to be the most promising fungicide tested for the control of avocado stem-end rot (*Diplodia natalensis*) and anthracnose (*Colletotrichum gloeosporioides*) [*Glomerella cingulata*: ibid., 20, p. 484]. Borax and borax-boric acid dips accelerated stem-end rot. Bioquin-1 was as effective as 6–6–100 Bordeaux mixture against mango anthracnose [*G. cingulata*: ibid., 30, p. 51].

Spraying experiments on the control of citrus melanose [*Diaporthe citri*: ibid., 29, pp. 88, 98] were conducted by R. F. Suit, A. F. Mathias, and C. R. Stearns (p. 269) as plot tests on Marsh grapefruit. The percentages of No. 1 grade fruit given by material No. 342 (1 pint per 100 gals.), zerlate (2 lb.), zinc-copper chromate (3 lb.), yellow cuprocide (1 lb.), Bordeaux mixture (3–3–100), copper-oil (1·3 per cent. oil), copper oxide (1 lb.), and no treatment were, respectively, 15·7, 64·5, 65, 73, 82·8, 66, 70, and 1·5. On a commercial scale portions of Valencia orange groves sprayed with copper oxide produced 98 per cent. No. 1 fruit when the spray was applied with a speed-sprayer and 99 per cent. when a conventional sprayer was used. With tribasic copper sulphate the figures were 96·2 and 98·4 per cent., respectively. R. F. Suit, L. C. Knorr, and E. P. DuCharme continued investigations (p. 293) on citrus spreading decline, 13 further groves being affected. An inverse relation was established between the amount of rainfall from 1st October to 1st June and rate of spread. Work is also being carried out to test the possibility of virus agency.

F[rancine] E. Fisher (p. 295) found no evidence that *Sphaerostilbe aurantiicola* and *Nectria diploa* [ibid., 23, p. 17] parasitize red or purple scale insects [*Lepidosaphes beckii* and *Chrysomphalus aeonidum*: ibid., 30, p. 270].

In studies on citrus decay by E. F. Hopkins, K. W. Loucks, J. C. Bowers, and O. R. McDuff (p. 306), 2,000 Valencia oranges were treated with nitrogen trichloride gas [ibid., 28, p. 286; 29, p. 616]; mould infection [*Penicillium digitatum* and *P. italicum*: ibid., 30, p. 227] decreased by 46 per cent., but stem-end rot (99 per cent. *D. citri* and 1 per cent. *Diplodia natalensis*) increased by 60 per cent. Total decay was 17 per cent. higher in the treated fruit than in the controls. Hamlin, Parson Brown, Pineapple, and Valencia oranges immersed for two minutes at room temperature in a 1·5 per cent. solution of dowicide A [loc. cit.] developed, respectively, during three weeks' storage 34, 37, 17, and 15 per cent. total decay (mould and stem-end rot), as compared with 58, 69, 46, and 45 per cent., respectively, for the untreated. On the Valencia oranges stem-end rot was reduced by 88 per cent. In a second experiment with 7,200 fruits the treatment (on Valencia oranges) gave 99 per cent. control of stem-end rot, 77 per cent. of mould, and 93 per cent. of total decay after two weeks, the corresponding figures after three weeks being 81, 51, and 75. Daubing oranges with 5 per cent. thiourea [cf. ibid., 26, p. 148] reduced stem-end rot (after three weeks' storage) by 90 per cent. and total decay by 75 per cent. Cost (including labour) was 5 to 6 cents a box.

Braun (A. C.). **Recovery of tumor cells from effects of the tumor-inducing principle in crown gall.**—*Science*, 113, 2945, pp. 651–653, 1951.

At the Rockefeller Institute for Medical Research, New York, when freshly cut stem surfaces of Turkish tobacco were inoculated with strain T-37 of the crown gall bacterium [*Bacterium tumefaciens*] the tumours, which formed in the region of the cambium, developed on their surfaces small areas of organized tissue, which rapidly grew into teratological structures. These complex overgrowths resembled those described on *Kalanchoe daigremontiana* [*R.A.M.*, 28, p. 119]. On White's medium fragments of normal tobacco tissue increased in volume only slightly in 12 weeks, the adventitious buds that developed often growing into small, but apparently normal plantlets. Bacteria-free tobacco tumour cells, however, grew rapidly and in a completely unco-ordinated manner, while fragments of bacteria-free tissue from the morphologically distorted but organized stem tissues of the teratomata grew rather less rapidly, but the rate was much greater than that of normal tissue. These cells possessed a well-developed capacity for differentiation and organization. Large areas of the surfaces of the cultures were covered with small adventitious buds and leaves displaying various degrees of structural development; some buds appeared normal, others were highly distorted. One clone of this tissue was maintained in culture for 16 months and the cells maintained their characteristic properties unchanged. The structures which develop from the teratomata thus appear to be composed of cells whose metabolism differs fundamentally from that of normal tobacco cells from comparable stem segments. When fragments of these abnormal tissues which had been carried in culture for over ten months were implanted in healthy hosts, they developed into teratomatous overgrowths attaining a diameter of about 1 cm. in six to eight weeks.

When normally produced axillary buds were removed from tobacco plants inoculated at the cut stem surface with *Bact. tumefaciens*, a complex tumour formed containing adventitious buds composed of tumour cells. The shoots developing from these buds were grafted to healthy tobacco plants from which all normal buds had been removed. The new growth from these shoots gradually became more and more normal in appearance and eventually behaved like normal tissue. It is concluded that the factor which causes crown gall tumour cells to develop abnormally becomes diluted in and then lost from affected cells which are forced to grow and divide with sufficient rapidity.

Todd (J. McA.). **An indigenous source of swollen shoot disease of Cacao.**—*Nature, Lond.*, 167, 4258, pp. 952–953, 1951.

The high incidence of cacao swollen shoot virus infection in *Cola chlamydantha* up to the limit of its range east and north-west of Wiawso and in other parts of the Western Province of the Gold Coast [*R.A.M.*, 29, p. 608 and next abstracts] and the occurrence of infected specimens where swollen shoot is absent strongly suggest that virus infection of *C. chlamydantha* antedates that of cacao. It is postulated that this indigenous host is the immediate natural source of cacao viruses in the Western Province and its control is of the greatest importance.

Report of Cocoa Conference held at Grosvenor House, London, 13th and 14th September, 1950.—x+70 pp., 7 pl., 4 diags., 1 col. graph, 6 col. maps, London, The Cocoa, Chocolate and Confectionery Alliance, Ltd., [1950].

In this report [cf. *R.A.M.*, 29, p. 204], J. West, dealing with the work done at the West Africa Cocoa Research Institute from 1944 to 1949 [cf. ibid., 30, p. 218 and next abstract], states that the evidence indicates that transfer of the virus of swollen shoot from wild plants to cacao is uncommon. Elimination of the insect vectors is not possible as yet. Where infection incidence is low simple cutting out

is effective, but if over 30 per cent. of the trees are affected entire block replacement is necessary. Weekly spraying throughout the year with standard Bordeaux mixture did not reduce losses from black pod [*Phytophthora palmivora*: loc. cit.] any more than the regular harvesting [of infested pods], and the latter is the cheaper operation.

S. Macdonald-Smith, dealing with the swollen shoot campaign in the Gold Coast [loc. cit.], states that in 1949 a boundary was fixed between a Special Area of mass infection, under the Commissioner for Cocoa Rehabilitation, and a General Area, under the Director of Agriculture, where infection was sporadic, the former containing the 'raging belt' plus a surrounding area where the disease was thought to be less prevalent. The aim of the re-introduced, cutting-out campaign was to establish in the shortest possible time a widening disease-free belt between the area of mass infection and the rest of the country. The staff of the Special Area are concentrating on the perimeter, and the containing action is more effective than was hoped, while in the General Area the scattered outbreaks are being brought under control as rapidly as possible. At present there are reasonable grounds for confidence that the quantity of production will be maintained. R. E. Walker describes the campaign for dealing with control and rehabilitation in the Special Area. The perimeter zone has been staffed and the intensive survey should be completed within 12 to 15 months. In the second zone considerable progress has been made with the initial cutting out treatment and re-inspection in 25 areas. Initial treatment is almost complete in the devastated Koforidua zone and rehabilitation should start after the end of 1950. R. D. Linton, dealing with control in other areas, which contain less than 10 per cent. of the total diseased trees, and rehabilitation progress in general, states that in Ashanti it is not expected that any new large outbreaks will occur, although re-treatment figures have been high. In the southern half of Trans-Volta and Togoland all known outbreaks have been treated and are under regular re-inspection. In the northern half no disease has yet been found, but only about one-fifth of the area has been intensively surveyed. In Old Western Province *Cola chlamydantha* trees [cf. ibid., 27, p. 557 and preceding abstract] are removed wherever found. A considerable amount of infection is present in the Wiawso district. In the western and north-western boundary there will soon be a wide belt which has been intensively surveyed and where all outbreaks have been treated and are under re-inspection.

R. Johns and A. V. Gibberd state that in Nigeria [ibid., 30, p. 23] two isolated outbreaks at Ilesha and in Abeokuta Province are now regarded as having been brought under control. Satellite infections round the main infested area are so numerous and widely scattered that infection must be considered endemic over a large area. It has been computed that in the endemic area some 245 sq. m. should be regarded as infected, involving 25,000,000 trees. Taking into account the farms adjoining this area, 79,000,000 cacao trees are exposed to infection. Cutting out is inapplicable in the endemic areas. The Nigerian Government has accepted the policy of abandoning the regions round Badeku and Olanla and allowing the disease to take its natural course; a defence line should be established east of the Oshun river, and another, running east and west, on the southern perimeter, the two forest reserves being used as part of the line. With regular patrolling and the immediate elimination of all foci of infection, it is believed that the eastern perimeter could be maintained as a clean area, or at least it could be prevented from developing into an endemic area threatening the Ife and Ilesha plantings. Actual losses in production from swollen shoot are regarded as insignificant in comparison with damage from other causes including black pod.

H. Evans states that in breeding work in Trinidad two Amazon clones were shown by field trials relying on natural infection to be resistant to *Marasmius perniciosus* [ibid., 29, p. 204; 30, p. 27] and they are being tested to ascertain the

nature of this resistance. Successful inoculation in the greenhouse has been carried out, probably for the first time in the study of this disease, on rooted fan and leaf cuttings and on seedlings of different ages. All attempts to infect the Amazon clones (S.C.A. 6 and S.C.A. 12) have failed. The Trinidad virus disease is transmitted exclusively by mealybugs; four species are concerned, of which *Pseudococcus citri* is the commonest [see next page]. The virus is non-persistent in the vectors. An appendix gives a report by O. J. Voelcker of the work of the West Africa Cacao Research Institute, 1944–9 [see next abstract].

Voelcker (O. J.). **Annual Report West African Cacao Research Institute. April, 1947 to March, 1948.**—85 pp., 1949.

In the section of this report [cf. *R.A.M.*, 30, p. 218 and preceding abstract] dealing with cacao virus diseases in West Africa (pp. 11–41) it is stated that as a result of patch grafting tests on seedlings it has been possible to group the Western Province viruses (F complex) [ibid., 30, p. 219] according to leaf symptoms into four main classes, within which further separation depends on finer differences in symptom expression. The classes are (1) mosaic, with fine veinbanding, uniform close flecking, and fern patterns, symptoms reminiscent of strain A [ibid., 27, p. 178]; (2) yellow mosaic as in (1), but the patterns tend to be bright yellow; (3) yellows, accompanied in the acute phase by a cloudy, non-particulate yellowing of the leaves; in the chronic phase flecking patterns are present; and (4) clearings, with yellow leaf patterns as in (3), while in the chronic phase conspicuous transparent lesions may be present alongside the larger veins. The component viruses (named after their type locality) are: (1) Amafie, Bosumuoso 1, Wiasi, Aiyiboso 1, Nsaura, and Suhuma Reserve; (2) Datano; (3) Punekrom, Surawno, and Aiyiboso 2; (4) Bosumuoso 2, Jamesi, and Bakukrom. A few, such as Bosumuoso 1, Aiyiboso 1, and Nsaura appear to be almost as virulent as virus A, but most are much milder, infected plants producing sequences of symptomless flushes in the chronic phase. With all but the mildest forms, however, marked defoliation occurs in outbreaks covering more than a quarter of an acre. No Western Province virus inhibited infection by virus A.

Viruses D, E, G, N, O_1, O_2, and O_3 [loc. cit.] conferred no protection against virus A [ibid., 27, p. 515]. The results indicate that a cacao virus with leaf symptoms markedly different from those of virus A is unlikely to be able to confer protection against it, though the converse is not true. In outbreaks affecting 50 trees or more, extensive variability of virus A appears to be the rule, but a tree is seldom completely or dominantly infected by attenuated strain A. Although later flushes of plants infected by the latter are usually symptomless, a certain critical concentration of virus must be maintained to account for the almost invariable immunity of such plants from attack by virulent virus A.

Experimental evidence demonstrated that there is no 'mass action' effect in mealybug (*Pseudococcus njalensis*) transmission. The probability of successful infection by one insect is 0·103 and by thirty 0·9617.

In the section dealing with mycology (pp. 67–69) the available evidence is stated to indicate that the association of *Calonectria rigidiuscula* [ibid., 26, p. 537; 30, p. 219] with capsid injury is relatively fortuitous. Cacao varieties appear to show considerable variation in susceptibility to the fungus, but some clones consistently gave a better performance than others. *Botryodiplodia theobromae* [loc. cit.] was consistently associated with cacao warty pod, which has been found at various localities in the Eastern Province, in Ashanti, and the Western Province; in these areas the symptoms are less severe than at Tafo. An affected pod bears one to many scattered protuberances. As the pod matures, the warts turn brown, and a rot rapidly extends from them; this sometimes affects the beans and may cause a pod to be discarded.

STRICKLAND (A. H.). **The entomology of swollen shoot of Cacao. I. The insect species involved, with notes on their biology.**—*Bull. ent. Res.*, 41, 4, pp. 725–748, 1 fig., 1951.

The entomology of cacao swollen shoot [see preceding and next abstracts] is a complex problem involving the interrelations in the field of over 120 insect species, and three Arachnids directly concerned in transmission. The present paper embodies the results of an attempt at classification of this material at the West African Cacao Research Institute, Tafo, Gold Coast. The first and most important of the three distinct but complementary ecological niches involved is the association between the mealybug virus vectors and the attendant ants. The second is the connexion between mealybugs of the genera *Paraputo* and *Formicoccus* and the wild forest tree hosts of the virus. The third is the negative relation between the mealybug-tending ants and *Oecophylla* and *Macromischnoides*, the two latter acting in certain circumstances as barriers to the spread of the former and hence to that of the mealybugs and virus.

KIRKPATRICK (T. W.). **Insect transmission of Cacao virus disease in Trinidad.**—*Bull. ent. Res.*, 41, 1, pp. 99–117, 1950.

The A and B strains of the virus disease affecting cacao in Trinidad [*R.A.M.*, 27, p. 222; 29, p. 204] are compared with the more virulent swollen shoot and related viruses prevalent in West Africa [see preceding abstracts]. The most important resemblance between the two virus groups is their exclusive transmissibility by mealybugs of the family Pseudococcidae [see preceding page]. There are also points of similarity in the symptoms, which in the case of the Trinidad virus (or viruses) consist mainly of a transient red veinbanding, sometimes accompanied by a more or less discontinuous, yellow vein-flecking and, on some varieties, red mottle on the pods. Swellings on the shoots, a conspicuous feature of most of the West African virus strains, have not been observed in Trinidad.

Of the four species of mealybugs definitely known to be vectors, *Pseudococcus citri* is undoubtedly responsible for most of the natural spread of the disease; the others are *P. brevipes*, a related but almost certainly distinct species, and *Ferrisia virgata*. Posnette's testing technique [ibid., 26, p. 384] has been adopted as a general practice at the Imperial College of Tropical Agriculture. The latent period of the virus in the test plants grown from dissected beans ranged from 20 to 123 days, with 30 to 50 as the usual period for the appearance of symptoms. Red veinbanding was a much more common feature than yellow flecking and almost invariably developed first when both were present. All three immature instars and young adults of the four vectors appear to be almost equally efficient in the transmission of the virus, though *P. brevipes* is perhaps slightly superior to the others in this respect.

The capacity of the mealybugs for virus transmission is not increased by starvation, nor is it materially affected by the duration of feeding either on the virus source plant or on the test bean. The shortest test-feeding time resulting in transmission was 90 minutes, which included, however, a considerable period of 'settling'. The insects can still transmit the virus if starved after infection-feeding for a period up to but not exceeding 22½ hours. A transmission rate of just under 14 per cent. has been obtained with single mealybugs to each test bean, but with larger numbers the rate did not rise according to mathematical expectation.

Pseudococcids can acquire infectivity by feeding on the symptomless parts of flush leaves showing symptoms on other portions, on entirely symptom-free flush leaves from infected trees, on the stem of a young infected plant, and on the leaves of the same after the disappearance of the ephemeral red veinbanding. They seem, however, to pick up the virus more readily from flush leaves actually showing

symptoms, and these were used as the source in most of the experiments herein described, which were conducted principally with strain A of the virus. In a few tests with strain B transmission was effected by *P. citri* and *P. brevipes*. All stages of *P. citri*, but especially young adults, often wander about of their own accord, and are thus capable of spreading the virus, particularly to trees in actual contact with an infected tree. Isolated new infections may be traceable to the transport within a plantation of cacao pods during harvesting.

Greenwood (M.) & Hayfron (R. J.). **Iron and zinc deficiencies in Cacao in the Gold Coast.**—*Emp. J. exp. Agric.*, 19, 74, pp. 73–86, 2 pl., 1951.

This is a full account of work in the Gold Coast, a preliminary note on which has already been noticed [*R.A.M.*, 26, p. 335].

In potted cacao seedlings affected by iron deficiency, chlorosis usually appeared in the first flush formed after the cotyledons had been shed. After two months, scorch appeared at the tip and spread along the margins to the mid-point of the leaf. In subsequent flushes there was continued decrease in pigmentation. The final leaves were white, papery, scorched, and hooked down at the tip and curved, and were retained for only two or three weeks, after which the plants died. Similar leaf symptoms appeared on year-old plants. Three applications of 1 per cent. solution of ferrous sulphate (plus sulphuric acid to counteract the lime) made at intervals of two days as soon as possible after the formation of each new flush gave satisfactory control.

The first symptom of zinc deficiency or sickle leaf [ibid., 24, p. 11] in potted seedlings and water cultures appeared as a bluish-green veinbanding in dark green leaves of normal shape; the leaves were dull and leathery and normally persisted unchanged. Succeeding leaves were similar and slightly corrugated. After the leaves had hardened small, chlorotic patches of primrose colour appeared between the veinlets on the crests of the folds, sometimes the entire leaf being covered by an attractive mosaic pattern. These mottled leaves persisted. Leaves of the next flush usually developed a sickle-leaf curvature or were straight but attenuated. Waviness occurred with both types. Plants receiving doses of bean ash exceeding 4 gm. per kg. of soil developed severe symptoms closely resembling those described by Ciferri from South America as 'narrow dented leaf' [ibid., 28, p. 9]. Painting soft, young leaves with a solution containing 0·5 per cent. ferrous sulphate, 0·33 per cent. zinc sulphate, and 0·05 per cent. sulphuric acid gave successful results. Seedlings grown in cultures lacking both zinc and iron and in complete nutrient maintained at pH 6·8 produced leaves with the curvature of zinc deficiency and the discoloration of iron deficiency.

Bruehl (G. W.). **Rhizoctoni solani in relation to cereal crown and foot rots.**—*Phytopathology*, 41, 4, pp. 375–377, 1 fig., 1951.

Rhizoctonia [*Corticium*] *solani* constituted a small percentage of the strains obtained in routine isolations from the root and crown tissues of wheat, oats, and barley from Minnesota and the Dakotas during the spring of 1948 [cf. *R.A.M.*, 27, p. 187]. Inoculated into Marquis wheat seedlings in the greenhouse at a mean temperature of 20° C., with soil moisture near the optimum, some of the ten isolates caused pre-emergence blighting by destruction of the elongating plumule, which became swollen, soft, watery, and brownish, while others induced only a brown discoloration of the coleoptile and lower leaf sheaths, or merely inconspicuous local lesions. The roots of infected seedlings remained healthy. Pre-emergence killing of Gopher oats assumed a similar form but was less common than in wheat. The first internode of the exposed stem was often the site of a local necrosis, which might well serve as a portal of entry for other pathogens and lead to severe crown rot.

Other members of the Gramineae, including *Agropyron cristatum*, *A. trachycaulum*, four varieties of oats, two of barley, ten of wheat (two durum and eight common), *Triticum timopheevi*, and sorghum, responded in much the same way as the foregoing to inoculation with *C. solani*. Lucerne, *Melilotus alba*, *M. officinalis*, and *Kochia scoparia* seedlings suffered heavy damage in the pre-emergence stage, with marked stunting and brownish lesions at the collar region of the survivors. Flax seedlings, on the other hand, were only mildly affected [cf. ibid., 30, p. 361].

Tervet (I. W.) & Cassell (R. C.). **The use of cyclone separators in race identification of cereal rusts.**—*Phytopathology*, 41, 3, pp. 286–290, 4 figs., 1951.

The identification of races of cereal rusts [*Puccinia* spp.] may be facilitated by using cyclone separators for collecting the spores [see below, p. 481] and spraying them in talc on to the host differentials. The period required for identification is reduced to 10 to 14 days by eliminating the necessity of a primary increase of the rust on a susceptible variety. The detachable base of the glass separator may be sealed and used as a spore storage unit. The small aluminium cyclone separator was used to evaluate the practicability of using field samples containing spores from a single pustule only or from two or three small pustules. By this method race mixtures and the need for further purification can be almost eliminated.

Petit (A.). **Laboratoire de cryptogamie.** [Cryptogamic laboratory.]—*Ex* Rapport sur les travaux de recherche effectués en 1949. [*Ex* Report on research work carried out in 1949.]—*Bull. Serv. bot. agron. Tunis* 19, pp. 21–26, 1950.

In intensive field inoculation trials carried out in Tunisia on the resistance of wheat to *Puccinia graminis* [*R.A.M.*, 29, pp. 147, 357] no variety was immune or highly resistant. Rust development was definitely retarded on three lines of Thatcher, one of Maroc × (Pusa × Florence), and an imported Italian line, Tenere, among the soft varieties (the two last-named being early or very early), and among the hard ones on a line of Sbéi × M'rari and one of Mahmoudi × M'rari [loc. cit.]. Most hard wheats are not early, except Sindyouk × Mahmoudi which escapes infection. It was noted in the experimental field that ears of varieties of average resistance if bent over became covered with small pustules, though the ears which remained erect were unaffected.

The presence of ears affected by smut [*Ustilago tritici*] would appear to have been due to faults in the hot-water treatment. The temperature of the second bath and of the third and fourth dryings should not be below 52° C. [ibid., 29, p. 148]. The treatment given in 1948 [loc. cit.] allowed an infection rate of under 1 in 10,000, the temperature of the second bath and the dryings being slightly too low for complete control. A change of seed might obviate recourse to special methods of disinfection.

The following chemicals, used mainly against bunt (*Tilletia levis*) [*T. foetida*], had no adverse effect on the germination of wheat seed [cf. ibid., 30, p. 263] when employed at a dosage of 2·5 gm. per kg. seed: (1) copper oxychloride (50 per cent. copper); (2) cupric chloride dust (12 per cent. copper); dusts containing (3) 15 per cent. hexachlorobenzene [ibid., 29, p. 148], (4) a base of methoxyethylmercuric silicate (1·5 per cent. mercury) [ibid., 30, p. 146], (5) an organo-mercury (1 per cent. mercury), and (6) ethyl mercury phosphate [loc. cit.] (3·8 per cent. mercury). The trials against *T. foetida* were made on the very susceptible Baroota, seed being mixed at a rate of 0·5 per cent. by weight with spores of the fungus. The inoculated seed was then mixed with the test substances at a rate of 0·25 per cent. by weight. Infection was completely eliminated by a dust containing 20 per cent. hexachlorobenzene and by dust (6). Materials allowing very slight infection sometimes were hexachlorobenzene (7 to 15 per cent.), dusts (1), (4), and (5), methoxyethylmercury

chloride (3·5 per cent. mercury, 15 minutes' immersion at 0·1 per cent.), and a liquid with an organo-mercury base (0·8 per cent. mercury). Results with cupric chloride dusts containing 8 to 12 per cent. copper varied from complete control to slightly more infection than in the foregoing group, but all these materials are considered to be sufficiently active against bunt. When cupric chloride dust was added to an organo-copper the resulting product (4 per cent. total copper) was more effective than either material used alone with a higher copper content.

Barley seed contaminated with covered smut (*U. hordei*) spores [loc. cit.] at the rate of 0·1 per cent. by weight was treated with dusts at 0·35 per cent. by weight. Only the organo-mercury compounds listed above, especially ethyl mercury phosphate, completely eliminated infection. The same dosage is recommended for oats against *U. avenae* and *U. kolleri* [ibid., 26, p. 337]. The effectiveness of the organo-mercury compounds was very marked and in some cases complete.

Popp (W.). **Infection in seeds and seedlings of Wheat and Barley in relation to development of loose smut.**—*Phytopathology*, 41, 3, pp. 261–275, 1951.

Studies were carried out at the Dominion Laboratory of Plant Pathology, Winnipeg, Canada, to determine the relative amounts of infection in embryos, seedlings, and adult plants of wheat and barley inoculated with races of *Ustilago tritici* [*R.A.M.*, 30, p. 264] and *U. nuda* [ibid., 30, p. 102], respectively. The fungus mycelium could be detected easily in embryos and seedlings if the tissues were macerated by boiling in 10 per cent. potassium hydroxide solution, washed, boiled in cotton blue in lactophenol, and mounted in dilute glycerine.

Wheat seed with uninfected embryos invariably produced adult plants free from loose smut. On the other hand, the number of smutted plants from seed having a high proportion of infected embryos depended on the variety and the particular race of loose smut [ibid., 30, p. 407] with which it was infected. There was evidence from one variety (Renown) that where wheat seed with a high percentage of infected embryos produced few smutted plants a continuous decline in infection occurred throughout plant development. In other varieties a reduction in infection occurred only at germination. Consequently seedlings gave a more reliable index of possible adult plant infection than embryos. Thus, resistance to loose smut in wheat is determined by the particular race used as inoculum, the reaction of the embryo, and the reaction of the tissues of the growing plant. A variety may be highly susceptible in the embryo stage and highly resistant in the seedling and adult stages.

In barley the prevalence of loose smut infection in embryos and seedlings of resistant and susceptible varieties was similar to that in adult plants.

Rademacher (B.). **Auftreten und Bekämpfung des Weizenälchens (Anguina tritici Steinb.) beim Dinkel (Triticum spelta) im Zusammenhang mit der Federbuschsporenkrankheit (Dilophospora graminis Desm.) und einer Bakteriose.** [The occurrence and control of the Wheat eelworm (*Anguina tritici* Steinb.) on Spelt (*Triticum spelta*) in connexion with the plumed spore disease (*Dilophospora graminis* Desm.) and a bacteriosis.]—*Z. PflKrankh.*, 57, 9–10, pp. 334–343, 4 figs., 1950.

Spelt in Württemberg, Germany, is frequently attacked by eelworms (*Anguina* [*Anguillulina*] *tritici*) in combination with twist disease (*Dilophospora graminis*) [*D. alopecuri*: *R.A.M.*, 14, p. 296; 18, p. 586] and, less commonly, a so far unidentified bacteriosis. In experiments from 1946 to 1948 the best control of *D. alopecuri* was obtained by pre-soaking wheat seed for four hours at 30° C. followed by a hot water steep for 30 minutes at 53° to 54°, and by 0·1 per cent. ceresan.

Suneson (C. A.). **Physiologic and genetic studies with the stripe disease in Barley.** —*Hilgardia*, 20, 2, pp. 29–36, 1950.

Further studies on barley stripe disease (*Helminthosporium gramineum*) [*R.A.M.*, 26, p. 151; 27, p. 231; 29, p. 95] at Davis, California, using complete floral inoculation of male-sterile barley with spores of the fungus, showed that wetting the spores and maintaining the plants in high humidity for six hours after inoculation did not induce better stripe development than when dry spores and low humidity were used. Under the experimental conditions stripe infection in the seed did not reduce germination. Seeds darkened by mycelial growth coincident with development produced higher levels of stripe than bright seeds that showed no spore growth before germination. Conspicuous mycelial development in the hull was about equal on all varieties, including those with genetic resistance. Mycelial development coincident with kernel development did not assure high levels of stripe expression, even in susceptible hybrids. Seasonal decline in stripe expression from autumn to spring was due to delayed seeding and appeared to be independent of soil temperature and soil moisture.

Evidence was obtained of the presence of two distinct physiologic races of the fungus. One was characterized by poor spore production on the test hosts and relatively low levels of infection. The other involved differences in pathogenicity. Four sources of genetic resistance were derived from Hannchen, Trebi, Club Mariout, and male-sterile, respectively, with dominance of resistance, partial dominance of resistance, dominance of susceptibility, and weak resistance, respectively. Collectively, at least six different genes appeared to be involved.

Riddle (O. C.) & Briggs (F. N.). **Inheritance of resistance to scald in Barley.**— *Hilgardia*, 20, 2, pp. 19–27, 1950.

In further breeding work in California on the inheritance of resistance in barley to scald (*Rhynchosporium secalis*) [*R.A.M.*, 28, p. 60; 29, p. 360] artificial inoculation was used as it facilitated the classification of resistant plants. The resistant variety La Mesita (0 to 2 type infection in the field, 0 in the greenhouse) was found to differ from susceptible Atlas (type 4 infection) by a single dominant or near-dominant gene for resistance. Trebi and California No. 1311 derived from it (both developing light infection in the field only) appeared to have the same dominant gene as La Mesita and a recessive gene for resistance. Turk was completely resistant in both field and greenhouse. Six completely resistant, single-gene extractions from Turk × Atlas (P-4229, P-4232, P-4233, P-4236, P-42683, and P-42709) showed good 3:1 ratios in F_2. All gave monohybrid ratios when crossed again with Atlas; all proved to have the same gene and were used in the breeding of resistant Atlas 46. The presence in Turk of one or more additional dominant genes for resistance was established. The single gene extracted from Turk appeared to be identical with the dominant gene found in La Mesita, Trebi, and Calif. No. 1311. In crosses between resistant varieties and selections no susceptible plants appeared in the F_2.

Davies (D. L. G.). **Ophiobolus graminis Sacc. var. avenae E. M. Turner in mid-Wales in 1948.**—*Trans. Brit. mycol. Soc.*, 33, 3–4, pp. 352–353, 1950.

In 1948, measurements of 24 samples of take-all (*Ophiobolus graminis* var. *avenae*) [*R.A.M.*, 23, p. 381; 24, p. 179] on oats, wheat, and barley in Breconshire, Cardiganshire, Carmarthenshire, Pembrokeshire, Radnorshire, and Montgomeryshire showed that the mean ascospore length varied from 92 to 140 μ. Modal length was widely variable within the range 87 to 141 μ. The greatest range in spore length within a single perithecium (80 to 130 μ) was exceeded in only six of the spore counts of the total survey and was equal to half the extreme range, viz., 69 to 169 μ, of all the samples. Within single asci a range of 32 μ in spore length was noted.

Sherbakoff (C. D.). **A correction of the identification of Helminthosporium causing black ear rot of Corn.**—*Phytopathology*, 41, 4, p. 378, 1951.

Black ear rot of maize in Tennessee, attributed in 1937 to *Helminthosporium turcicum* [*R.A.M.*, 16, p. 450], has since been found to be caused by *H. carbonum* [ibid., 29, p. 361].

Porter (R. H.). **Treatment of crop seeds in Brazil and Paraguay.**—*Phytopathology*, 41, 4, pp. 367–374, 1951.

Experimental fungicidal treatments of cereal and vegetable seeds in São Paulo, Brazil, and at the National Agronomic Institute, 50 km. east of Asuncion, Paraguay, from 1946 to 1949 were performed exclusively with the dusts arasan, phygon, granosan, ceresan, spergon, semesan jr, and seedox (applied to wheat in 1949) [*R.A.M.*, 29, p. 95], all of which except the last-named are in general use in the United States.

Significantly higher germination percentages resulted from the treatment of maize only when the seed (mostly hard dent or flint) was planted in the winter months of June, July, or August at relatively low soil temperatures. Wheat seed imported from the United States and planted in Paraguay in May, 1947, was not benefited by the treatments, which did, however, markedly improve both germination and grain yields in Brazilian wheat seed sown in May or June in moist peat soil in the Paraiba Valley, São Paulo. Seed of the Sales, No. 35, Frontana, Kenya, and Fronteira varieties, planted in Brazil in 1948, was heavily infected by a species of *Fusarium*, which probably accounted for the low percentage of germination (mean 23 per cent.) in the untreated plots; arasan and 1 per cent. granosan (each at 2 gm. per kg.) resulted in increases to 55·2 and 43·4 per cent., respectively.

Hull-less groundnut seed responded to treatment by a significant rise in germination in both countries, while in one test in Brazil the yield from dusted seed was also appreciably higher than that of the untreated. The mean germination percentages of one sample of Detroit Dark Red garden beet seed in Paraguay in 1947 were as follows: controls 12·5, arasan 23·5, phygon 22·5, and 5 per cent. ceresan 25·5. The germination of samples of ten pea varieties was raised to a varying extent by the treatments.

Treatment had little effect on rice, beans (including Lima bean [*Phaseolus lunatus*]), and sorghum seed.

Kelman (A.) & Hebert (T. T.). **Influence of light on the germination of sporangia of Physoderma zeae-maydis.**—Abs. in *Phytopathology*, 41, 1, p. 20, 1951.

The germination of sporangia of *Physoderma zeae-maydis* [*P. maydis*: *R.A.M.*, 29, p. 504; 30, p. 125] in water was influenced by the intensity and quality of light and the duration of the illumination period. At 28° C. the incidence of germination rose according to the logarithm of the light intensity as this increased from 0 to 12 foot-candles. Light intensity requirements were less at this temperature than at a lower range. Three days' exposure of the sporangia to alternating 12-hour periods of light and darkness was equally effective with continuous illumination. Following 24 hours in darkness, one 12-hour period of illumination sufficed for high germination. Blue light gave a high and green a low rate of germination, while none occurred under yellow or red light, even at high intensities, so that quality rather than quantity appears to be the decisive factor.

LeBeau (F. J.). **A method for large-scale inoculation of Sorghum with Colletotrichum.**—*Phytopathology*, 41, 4, pp. 378–379, 1 diag., 1951.

The evaluation of numerous African and Indian varieties and segregating progenies of sorghum for their reactions to anthracnose and red rot (*Colletotrichum*)

[*graminicola*: *R.A.M.*, 29, pp. 300, 411, 535] at the U.S. Sugar Plant Field Station, Meridian, Mississippi, necessitated large-scale field and greenhouse inoculations in order to obtain a reliable rating. The following modifications of the slow and tedious hypodermic injection technique were accordingly devised. A 3-gal. compressed-air sprayer was fitted with an 18- or 24-gauge needle, which was inserted in the leaf whorl about 6 in. below the top. Under a pressure of 20 to 30 lb. per sq. in. the spore suspension in the tank streamed out of the needle a few seconds after insertion. Two men could inoculate 300 to 400 plants in one hour. Three to four dozen severely infected sorghum leaves, kept overnight in a moist chamber at room temperature, provided enough spores for 5 to 10 gals. of a suspension of sufficient density to ensure inoculation.

The introduction of inoculum into stalk tissue by this method was precluded owing to the excessive plugging of the needle by fibres of the cortical layers until a special needle was designed to obviate this difficulty. The open end of a 12- or 14-gauge needle, 1½ in. long, was plugged with silver solder and sharpened to a fine point. Four roughly 24-gauge holes were bored through the side walls of the needle about ½ in. from the tip at right angles and disposed at ⅛-in. intervals along its length. The needle, used with the compressed-air sprayer, was inserted into the stalk tissues and held there momentarily.

Schneider (Yu. I.). Результаты изучения бактериального некроза Цитрусовых. [Results of studies on bacterial necrosis of Citrus.]—Микробиология [*Microbiology*], 20, 1, pp. 41–51, 3 figs., 1 graph, 1951.

At the Bacteriological Laboratory of the Moscow Station of the Pan-Soviet Institute for Plant Protection the author studied bacterial necrosis in citrus trees. *Bacterium* [*Pseudomonas*] *citriputeale* [*R.A.M.*, 20, p. 252], probably identical with *Phytomonas* [*Pseudomonas*] *syringae* [ibid., 28, p. 453; 29, p. 464], appears to be the cause of blast of leaves and shoots and black pit lesions on the fruit. In the spring of 1949 mandarins were infected with this bacterium by inoculation. On diseased branches and twigs there were 33 per cent. less leaves than on the sound ones, which produced 38 per cent. more shoots, while fruit production was three times greater.

Pathogenic strains of the bacterium have been isolated from lemon, mandarin, sweet and sour orange, *Fortunella* sp., and tung (*Aleurites fordii*). Nearly all citrus species and their hybrids in the Black Sea regions of the Caucasus were infected in shoots, leaves, and fruit, infection being contracted especially from March to May and through damaged tissues. Infection in the Soviet subtropics is propagated only from citrus to citrus.

The optimum temperature for growth of *P. syringae* is from 15° to 25° C.; growth is still possible near 0°, but above 25° it ceases. The bacteria remain alive in dead branches on the tree or after pruning, and in fallen leaves, but there is no overwintering in twigs or in the soil.

Control measures include the provision of some means of protection against wind, pruning diseased twigs in the autumn, destruction of prunings and fallen leaves, and spraying thoroughly in March and November with 1 per cent. Bordeaux mixture.

Klotz (L. J.). **Brown rot gummosis of Citrus.** –*Calif. Citrogr.*, 36, 2, pp. 48, 67–68, 1 fig., 1950.

In this survey of the causes, symptoms, and control of citrus brown rot gummosis and foot rot (*Phytophthora citrophthora*, *P. hibernalis*, and *P. syringae*) [*R.A.M.*, 30, pp. 267, 310, 411] it is stated that prevention in new or replacement plantings may be attained by the choice of a relatively resistant stock, but it is important that

it should not be susceptible to other fatal diseases, such as quick decline [ibid., 29, p. 617]. Sweet orange on sour orange stock, for example, highly resistant to gummosis, is very susceptible to quick decline. Stock should be chosen primarily for its suitability from a cultural standpoint, reaction to gummosis being regarded as of secondary importance. Work at the California Citrus Experiment Station, Riverside, has resulted in a grading of citrus stocks according to their mean resistance as groups to brown rot gummosis: Sampson tangelo [ibid., 28, pp. 213, 571], sour orange, and Marumi and Nagami kumquat (*Fortunella* sp.) are resistant. Because of the excellent bud union and the rapid growth made by commercial citrus varieties on sweet orange rootstock, and the desirability of avoiding quick decline, many growers are demanding these rootstocks. The procedure recommended for new planting material is as follows. From nursery trees balled in burlap a representative sample (usually 5 to 10 per cent.) should be carefully examined by exposing the crown. All infected trees, and if over 10 per cent. show infection the whole consignment, should be rejected. Before planting the trees should be protected against brown rot gummosis. Balled trees should have the balls dusted or sprayed with fungicide. Bare root trees may be cleaned of infection by immersion in hot water (110° F. for 6 to 10 minutes, 111° for 3 to 8 minutes, or 112° for 2 to 6 minutes). The trees should be planted high, with the first side roots barely under the soil surface. Shortly before the first irrigation the trunk should be dusted up to 1 ft. with Bordeaux mixture or zinc-copper-lime dust or washed with a suspension of these materials. Two liquid applications suffice, but dusting should be repeated every four months during the first year. When conditions favouring infection prevail this protective treatment should be continued for a second year or until it is no longer necessary for irrigation water to reach the trunks. All orchards should be inspected at least once a year. If infection is present in parts above the ground the soil should be removed down to the first lateral roots, without leaving depressions in the ground unless a drainage outlet is provided, and curative treatments applied.

Klotz (L. J.). **Report on mal secco disease.**—*Calif. Citrogr.*, 36, 2, pp. 74–75, 1950.

During August, 1950, the author visited the lemon and bergamot [*Citrus aurantium* var. *bergamia*] plantations in south Italy and Sicily and made observations on 'mal secco' disease (*Deuterophoma* [*tracheiphila*: *R.A.M.*, 30, pp. 317, 413]). About 5 to 10 per cent. of the bergamot trees are infected in the tops, but the disease is readily controlled by pruning the infected twigs. The fungus was readily isolated from twigs, but not from third-grade lemon fruits or from Sicilian lemons purchased in various parts of Europe [cf. ibid., 9, p. 645]. In one instance *D. tracheiphila* was isolated from a bergamot twig with no outward evidence of the disease. The twig had large, green fruit at the tip, and the wood within 2 in. of the fruit contained the fungus.

Knorr (L. C.) & DuCharme (E. P.). **The relationship between Argentina's lepra explosiva and Florida's scaly bark, with implications for the Florida Citrus grower.**—*Plant Dis. Reptr*, 35, 2, pp. 70–75, 4 figs., 1951. [Multilithed.]

The authors describe the characteristics of 'lepra explosiva' [*R.A.M.*, 30, p. 104] and scaly bark (leprosis) in Florida in comparative tables, and demonstrate that the two diseases are the same.

In Florida the disease is at present almost extinct. The regular spraying and dusting programme (especially with sulphur) has eliminated the causal agent, a mite of the genus *Brevipalpus*. It is not clear as yet, however, whether the disease is caused by a toxin secreted by the mite [loc. cit.], or whether the latter is a virus vector. The authors urge the adoption of the name 'leprosis' for both diseases.

Heim (R.). **La carbunculariose du Caféier.** [Carbunculariosis of Coffee trees.]—*Rev. Mycologie, Suppl., colon.*, 15, 2, pp. 89–98, 1 pl., 31 figs., 1950.

The author gives reasons for proposing the adoption of the name *Gibberella xylarioides* (Steyaert) Heim & Saccas [*R.A.M.*, 30, p. 229] for the perfect state of *Fusarium xylarioides* [ibid., 28, p. 31] causing carbunculariosis of coffee in the Ivory Coast [ibid., 30, p. 269] and Belgian Congo. The fungus is placed in the section *Carbuncularia* of the genus.

Grassé (P. P.) & Heim (R.). **Un Termitomyces sur meules d'un Ancistrotermes africain.** [A *Termitomyces* on the fungus stones of an African *Ancistrotermes*.]—*Rev. sci., Paris*, 88, 3305, pp. 3–13, 14 figs., 1950. [Received July, 1951.]

A full description is given of *Termitomyces medius* n.sp. [cf. *R.A.M.*, 29, p. 302], developing from the fungus stones found in nests of *Ancistrotermes latinotus* at Bossambélé, Ubangi [French Equatorial Africa].

Heim (R.) & Buchli (H.). **Un champignon parasite du Termite de Saintonge.** [A fungus parasitic on the Saintonge Termite.]—*C. R. Acad. Sci., Paris.*, 232, pp. 277–280, 1951.

Termites (*Reticulitermes* sp.) taken from an old walnut trunk at La Rochelle, France, in July, 1949, bore dark brown conidiophores growing on various parts of their bodies. Each individual consisted of a row of cylindrical or barrel-shaped, ochraceous-brown cells forming a chain of pseudo-arthrospores 100 to 120 μ high and 4·5 to 5 μ wide, resembling *Hormiscium* but terminated by a larger sporiferous head. This was ovoid or irregularly cylindrical, up to 50 μ long, smooth, and divided by fewer than 18 transverse septa into superimposed cylindrical cells 8 to 15 μ wide, flat, and unequally pigmented. These simple conidiophores, whose growth continued after rupture, were always arranged in pairs, each one of a pair arising from one of the two central cells of pointed-ellipsoid, quadrilocular capsules with brown walls which measured 21 to 26 by 8 to 9 μ and adhered tightly to the insect. The fungus is to be placed in a new genus, *Antennopsis*, of which it will be the type species, *A. gallica* [without Latin diagnoses].

No hyphae or histological changes were found in the bodies of infected insects, and it does not seem likely that the fungus can be used to control the termites. Further work is in progress.

Duddington (C. L.). **Further records of British predacious fungi. I.**—*Trans. Brit. mycol. Soc.*, 33, 3–4, pp. 209–214, 3 figs., 1950.

Descriptive notes are given on the following fungi found in England: *Dactylella cionopaga* [*R.A.M.*, 29, p. 304], *D. ellipsospora* [ibid., 29, p. 618], *Arthrobotrys musiformis* [ibid., 17, p. 36], and *Tridentaria implicans* [ibid., 19, p. 703], all capturing nematodes, and *Acaulopage tetraceros* [ibid., 21, p. 488] and *Stylopage rhynchospora* [ibid., 18, p. 798] attacking amoebae. Except *D. ellipsospora*, all are new records for Britain.

Drechsler (C.). **Various zoöpagaceous fungi subsisting on protozoans and eelworms.**—*Mycologia*, 43, 2, pp. 161–185, 6 figs., 1951.

Descriptions are given of *Cochlonema calosperma* n.sp., *Aplectosoma microsporum* n.gen., n.sp., both endoparasitic in amoebae in Maryland, and the zygospore stage of *Acaulopage lophospora* [*R.A.M.*, 25, p. 342]. Some discussion is given to two other species which subsist endoparasitically in protozoans, and incomplete observations on a nematode parasite referable to the genus *Euryancale* are recorded.

Wallace (M[aud] M.). **Report on a visit to the Sisal Research Station, Mlingano, to investigate rots in Sisal.**—Tanganyika Territory Sisal Research Station, Ngomeni, [Publication] No. 3, 9 pp., 2 figs., 1950.

Two forms of sisal bole rot [*R.A.M.*, 17, p. 15; 29, p. 350] were investigated by the author at the Sisal Research Station, Mlingano, Tanganyika, in February, 1950, a dry rot and a wet one. Plants affected by the former are pale. In cut plants the leaf bases are hard and normal and no foul odour is emitted. A hard, dry, more or less conical, pink, discoloured area is apparent at the base of the plant and a brownish-grey rot spreads upwards. The healthy tissue is separated from the diseased by a wavy line of darker brown. All uprooted affected plants bore insect or mechanical injury at the base. Isolations from the affected parts of two boles yielded *Aspergillus niger*, which apparently acted as a wound parasite.

The wet rot is a soft, evil-smelling decay beginning at a cut leaf base. The affected areas are brown to mustard and yellow [ibid., 12, p. 201], bright pink at the margins, and there is no obvious injury in the underground part. Isolations from affected boles yielded *A. niger*, bacteria, and a yeast-like fungus.

In inoculation tests with rooted bulbils in pots *A. niger* from the wet rot gave positive results on wounded boles and leaves when the plants were kept in a damp chamber for two to five days, the fungus being re-isolated from the affected plants. It is concluded that the conditions required by *A. niger* to produce rotting in sisal suckers are wounded surface and the presence of moisture. In the case of mature plants other conditions may, perhaps, be necessary.

Cooley (J. S.). **Control of white root rot with chloropicrin in a border of ornamental plants.**—*Phytopathology*, 41, 4, pp. 379–380, 1951.

A serious outbreak of white root rot (*Corticium galactinum*) at Silver Spring, Maryland, in 1941 involved *Baptisia australis*, *Exochorda racemosa*, *Iris* (*Pogoniris* group), winter jasmine (*Jasminum nudiflorum*), peony, *Prunus glandulosa*, *P. triloba*, *Spiraea thunbergii*, and *Viburnum carlesii*, none of which has previously been recorded as a host of the fungus [*R.A.M.*, 19, p. 354]. All the diseased plants were removed from the infested zone and for 2 to 3 ft. beyond any evidence of root infection, resulting in a plot of 240 sq. ft. On 3rd September, 1941, chloropicrin was injected into the soil at staggered 1-ft. intervals (2 ml. per injection), the surface thoroughly wetted and covered with water-impervious paper, with the margins buried to a depth of 16 in., to retard the escape of the gas. The plot was replanted in the spring of 1942 with various species, some of which were susceptible, and again in 1947. Inspection at intervals from 1942 to the end of 1949 revealed no sign of root rot in the replanted plot, so that chloropicrin is evidently effective in the elimination of the pathogen.

McWhorter (F. P.) & Anderson (C. J.). **Diseases in Croft Lily plantings, 1949–50.**—*Plant Dis. Reptr*, 35, 2, pp. 106–108, 1 fig., 1951. [Multilithed.]

In 1950 several fields of Croft lilies in Oregon were severely damaged by *Botrytis* blight [*B. elliptica*: *R.A.M.*, 26, p. 154; 30, p. 230] in spite of Bordeaux mixture sprays. Scorch, a physiological disorder [cf. ibid., 30, p. 416], is probably responsible for much injury formly attributed to *Botrytis* blight. A three-year survey showed that the distribution of the streak-fleck complex, caused by strains of western cucumber mosaic virus [ibid., 30, p. 25], closely follows that of commercial cucumber plantings. In 1950 it was found in only six fields, all in northern Oregon.

Rumley (Gail E.) & Thomas (W. D.). **The inactivation of the Carnation-mosaic virus.**—*Phytopathology*, 41, 3, pp. 301–303, 1951.

In experiments at the Colorado A & M College, Fort Collins, the exposure of

extracts of mosaic virus from infected carnations [*R.A.M.*, 30, p. 404 and next abstract] for ten minutes to temperatures between 40° and 80° C. resulted in a gradual decline in virulence on *Dianthus barbatus* test plants, the decline being most abrupt above 60°. No infection occurred in plants inoculated with extracts heated at 70° or over. Heat treatment of infected plants resulted in high mortality.

Treatment of infected, unrooted carnation cuttings with nine chemicals [ibid., 29, p. 563] indicated that 0·2 per cent. calcium chloride and 0·025 per cent. zinc sulphate may be effective against the virus *in vivo*, since half of the plants thus treated recovered and no mosaic developed when extracts from these plants were tested on healthy *D. barbatus*. The phytotoxic effect of the chemicals, however, makes treatment of unrooted cuttings impracticable.

Thomas (W. D.), Baker (R. R.), & Zoril (J. G.). **The use of ultraviolet light as a means of diagnosing Carnation mosaic.** —*Science*, 113, 2942, pp. 576–577, 1951.

A modified ultra-violet light method for detecting mosaic virus in carnations [see preceding abstract] was tested over a period of three years by examining extracts from 35,763 cuttings from 11 varieties. Two gm. of carnation terminal vegetative shoot were autoclaved in 10 ml. of distilled water for 45 minutes at 15 lb. pressure, 2 ml. of *n*-butanol was added to the solution, shaken vigorously, and allowed to settle. A drop of concentrated ammonium hydroxide was added to increase the pH, and the solution placed before a 250-w G-E Mazda mercury-arc lamp, type A-H4, using filter No. 41, which transmits light of wave-lengths between 3,253 Å and 4,200 Å. Extracts of mosaic-infected plants fluoresced pale pink at the interface between the water and the butanol. Each of the carnation plants was also tested by sap inoculation to five test plants of *Dianthus barbatus*. The numbers of infected carnation plants as detected by ultra-violet light and by inoculation were, respectively, 35,670 and 35,678. This method has proved useful for over two years in indexing carnation cuttings for foundation stock.

Stoddard (E. M.) & Dimond (A. E.). **The chemotherapeutic control of Fusarium wilt of Carnations.**—*Phytopathology*, 41, 4, pp. 337–340, 1 graph, 1951.

Further particulars are given of trials at the Connecticut Agricultural Experiment Station in the control of carnation wilt (*Fusarium dianthi*) [*R.A.M.*, 30, p. 417] on the Miller's Yellow variety in sterilized greenhouse soil by means of chemotherapy. For a month from 19th July, 1949, the soil round each plant was treated twice weekly with four fungicides at the rate of 50 ml. solution per plant. After the first month the treatments were made at weekly intervals until 15th September, and for a fortnight from 30th August the concentration of the chemicals was doubled. All the treatments except copper-8-quinolinolate (1 in 4,000) [cf. ibid., 30, p. 368] effectively combated the disease, and their chemotherapeutic value was confirmed by further experiments on the Hercules variety in 1950, when the incidence of wilt was reduced from 50·6 per cent. in 350 untreated cuttings to 2·9 per cent. in 3,026 treated at weekly intervals for about four months with 2-norcampane methanol (1 in 16,000) [ibid., 30, p. 417]; to 3·2 per cent. in the 1,530 treated with 4-chloro-3,5-dimethyl phenoxy ethanol (1 in 64,000); and to 4 per cent. in the 1,575 treated with 8-quinolinol sulphate [1 in 4,000].

Spencer (J. L.) & White (H. E.). **Anther smut of Carnation.**—*Phytopathology*, 41, 3, pp. 291–299, 1951.

Studies at the University of Massachusetts, Amherst, showed that the life-cycle and action of the anther smut fungus, *Ustilago violacea*, in parasitizing carnations [*R.A.M.*, 29, p. 606] is essentially similar to its reported effects on other members of the Caryophyllaceae. The minimum, maximum, and optimum temperatures for

spore germination are 5°, 36°, and from 16° to 22° C., respectively. Air-dried spores germinated readily after storage for two months at 20°, 0°, and −25°. Smutted flowers stored at the same temperatures yielded spores which germinated in slightly higher percentages than the air-dried spores. One per cent. of the spores germinated at 94 per cent. relative humidity, 41 per cent. at 99 per cent., and 25 per cent. in water. At high relative humidities infection tubes were generally produced directly from the promycelium while water favoured the formation of sporidia. The highest germination (32 per cent.) was secured in soil at 50 per cent. water-retaining capacity; germination decreased between 60 and 80 per cent. capacity and was arrested at 90 per cent.

Inoculation experiments demonstrated that infection cannot be induced through unbroken surfaces except on the flowers. Flowers, buds, and excised stems were the most susceptible areas, in that order, and young growth was more susceptible than old. Infected sand and soil may be a source of inoculum.

Jensen (D. D.). **Mosaic or black streak disease of Cymbidium Orchids.**—*Phytopathology*, 41, 5, pp. 401–414, 3 figs., 1951.

Cymbidium mosaic virus is widespread in North America and the same or a similar disease has been reported from England by Moore [*R.A.M.*, 27, p. 461]. It is probably also identical with the disease reported under the same name from Australia [ibid., 23, p. 261]. *Cymbidium lowianum* and *C. insignis* have been found naturally infected in California, and there is no evidence that any species or hybrids of the genus are immune.

The first symptoms develop about six weeks after infection in the form of small, faintly chlorotic streaks and patches on the younger leaves. The mottling gradually becomes more prominent and is followed by necrotic spots, streaks, and rings. The flowers do not appear to be involved. The virus is readily transmissible by juice inoculation. It retains its infectivity *in vitro* for at least seven days at room temperature and also withstands ten minutes' heating at 65° C., but is inactivated at 70°. The virus survived in infected plants submerged in water at 45° for two hours. There is no reason to suppose that the disease is seed-borne. The limited host range of the *Cymbidium* mosaic virus—24 species of plants, including *Cattleya* [ibid., 29, p. 309], representing 20 genera and 15 families, did not respond to mechanical inoculation—suggests that it may not have been previously described.

In addition to mosaic, occasional *Cymbidium* plants in California display foliar anomalies indicative of virus infection, e.g., a conspicuous yellow and green mottle with some of the yellow areas enclosing islands of green tissue; a condition known as 'diamond mottle', in which some of the yellow areas are diamond-shaped and also enclose green islands; a brown to black flecking and streaking coalescing into well-marked patterns; and small, chlorotic, whole or fragmentary, often coalescent rings on normal green tissue. So far only the yellow and green mottle has been transmitted by juice inoculation to a single seedling, on which the symptoms first appeared 51 days later and at four months were indistinguishable from those of the mosaic virus.

Gould (C. J.). **Gladiolus dry rot tests in Western Washington.**—*Plant Dis. Reptr*, 35, 2, p. 109, 1951. [Multilithed.]

Dry rot [*Sclerotinia gladioli*: *R.A.M.*, 28, p. 399] is the most important corm disease of *Gladiolus* in western Washington. In 1950 Picardy corms from a severely infected stock were steeped for one hour in various fungicides before planting. Emergence and rate of blooming were stimulated by tersan (1 lb. in 6 gals.) and natriphene (1 lb. in 96 or 193 gals.) [ibid., 30, p. 372]. Mersolite W (phenyl mercuric acetate) [cf. ibid., 29, pp. 306, 307] had a retarding effect, but at concentrations of 1 in 241, 1 in 482, and 1 in 723 gave 97·3, 94·3, and 93·1 per cent. healthy corms at

harvest; with tersan 71·3 per cent. were healthy, while with natriphene they were almost as poor (44·4) as the untreated (33·3).

Weimer (J. L.). **Anthracnose resistance in Lupines.**—*Plant Dis. Reptr*, 35, 2, pp. 80–81, 1951. [Multilithed.]

At the Georgia Experiment Station various strains of blue lupin (*Lupinus angustifolius*) and some yellow (*L. luteus*) and white (*L. albus*) selections were tested for resistance to anthracnose (*Glomerella cingulata*) [*R.A.M.*, 29, p. 417, and above, p. 452]. While all the inoculated, locally grown commercial blue lupins developed most severe infection, blue lupins P.I. 167938, P.I. 167943, P.I. 168529, P.I. 168534, and P.I. 168535, and yellow P.I. 168539 (all from Portugal) were highly resistant in the early stage of growth. However, these introductions possess poor commercial qualities and are considered at present only as a good source of anthracnose resistance. They are not highly resistant to brown spot (*Ceratophorum setosum*) [loc. cit.], but are more so than many commercial varieties.

Weimer (J. L.). **Ascochyta canker of blue Lupine.** – *Plant Dis. Reptr*, 35, 2, pp. 81–82, 1951. [Multilithed.]

During the late winter and spring of 1949 and 1950 blue lupin (*Lupinus angustifolius*) plants in experimental plots at Experiment, Georgia, developed dark brown cankers 1 to 3 in. long near the stem bases, resulting in the death of the plants. The same disease, which always occurred on plots previously cropped with cotton, was also found in commercial fields in several localities in central Georgia. The fungus isolated from the cankers was similar to if not identical with *Ascochyta gossypii* [*R.A.M.*, 30, p. 105]. Greenhouse inoculations of cotton and lupin plants produced numerous lesions on the leaves and petioles of the former, but only on the cotyledons of the latter, indicating that the fungus is a weak parasite on lupin.

Kilpatrick (R. A.) & Hanson (E. W.). **Relative prevalence of fungi associated with root and crown rots of Red Clover in Wisconsin.**—Abs. in *Phytopathology*, 41, 1, p. 21, 1951.

The relative prevalence of the several fungi associated with red clover crown and root rots in first- and second-year stands was determined at monthly intervals during the growing season at one place in 1949 and at five locations in 1950. The most frequent isolates in both years were *Fusarium oxysporum*, *F. solani*, and *F. 'roseum'* [cf. *R.A.M.*, 22, p. 68; 25, p. 366; 29, p. 292]. *F. oxysporum* predominated in first-year stands, constituting 50 to 70 per cent. of the total isolates in 1949 and remaining widespread, though less abundant, in 1950. The relative prevalence of this species, though still high, decreased in second-year stands. *F. solani*, on the other hand, was more abundant in 1950 than in 1949 and its incidence was higher in second-year stands, increasing with the age of the plants. *Pythium* spp. constituted only a small percentage of the total isolates and occurred chiefly on young plants.

Lehman (S. G.). **Curvularia leaf blight of Ladino Clover.**—*Plant Dis. Reptr*, 35, 2, pp. 79–80, 1 fig., 1951. [Multilithed.]

In October, 1948, the author detected leaf blight on 5 per cent. of Ladino clover growing at Plymouth and Raleigh, North Carolina, and the disease has recurred each year since. Infection starts at the leaf tips or margins and spreads inwards, forming a V-shaped lesion. Under conditions of high humidity entire leaflets and petioles are invaded, wilt, and collapse. Diseased tissue is chlorotic at first, but soon becomes light brown, watery, and more or less translucent, with chlorosis at the advancing edge. Isolations yielded *Curvularia trifolii* [cf. *R.A.M.*, 3, p. 456;

26, p. 406]. Inoculated clover plants developed typical symptoms after nine days and the fungus was re-isolated.

The disease develops rapidly during warm, wet periods in the autumn, winter, and spring, but is apparently of little importance in fields that are closely pastured or frequently mown. In areas where the foliage is allowed to stand for a long time, such as along roadways and fences, infection amounted to 20 to 25 per cent.

KLOSTERMEYER (E. C.) & MENZIES (J. D.). **Insect transmission of Alfalfa witch's-broom virus to other legumes.**—*Phytopathology*, 41, 5, pp. 456–458, 1 fig., 1951.

Transmission of the lucerne witches' broom virus by the leafhopper *Scaphytopius dubius* (formerly known as *Platymoideus acutus*) to *Medicago lupulina* and *M. hispida* has already been reported from the Washington Agricultural Experiment Station [*R.A.M.*, 26, p. 62]. In a further series of tests 13 other forage legumes, namely, *M. falcata*, *M. ruthenica*, *Melilotus alba*, red, white, Ladino, and subterranean clovers, *Lotus corniculatus*, *Astragalus falcatus*, *A. chinensis*, *A. mortoni*, *Lathyrus latifolius*, and *Hedysarum coronarium*, developed the typical symptoms of the disease following inoculation with viruliferous leafhoppers of the same species. The incubation period was protracted, the minimum interval between inoculation and the development of recognizable symptoms being 74 days. Infections were obtained with previously non-viruliferous insects after feeding for three days on diseased lucerne and for seven days on healthy *L. latifolius*, indicating a latent period, if any, of less than ten days. In three cases the virus was transmitted during a 24-hour feeding period on the test species. One group of 20 insects that had been reared on diseased lucerne remained infective for 13 days, during which they inoculated five *M. alba* plants in serial transfers. Other retention periods of 9 to 11 days were noted.

SLEETH (B.). **Witches' broom of Alfalfa in the Southwest.**—*Plant Dis. Reptr*, 35, 2, pp. 77–79, 1951. [Multilithed.]

Witches' broom of lucerne [*R.A.M.*, 28, p. 18 and preceding abstract] is one of the most important lucerne diseases on the Yuma Mesa, Arizona, reducing considerably the yields of hay and seed. Some stands, especially the older and less dense ones, have up to 25 per cent. of infected plants. The disease, first reported in 1944, has spread from the localized point of initial infection to areas up to 30 miles to the east and west. The present practice is to keep stands as long as they are productive and to renovate rather than destroy the old stand and reseed, thus building up a continuous source of inoculum. As ploughing and reseeding every two or three years would prove too expensive for many farmers, the need for the development of a resistant variety is emphasized.

FRAZIER (N. W.). **Red leaf, an aphid-borne virus disease of Filaree.**—*Phytopathology*, 41, 3, pp. 221–227, 2 figs., 1951.

White-stem, red-stem, and broad-leaved filaree (*Erodium moschatum*, *E. cicutarium*, and *E. botrys*, respectively), which are among the most valuable and abundant of range forage plants in California, are commonly affected by a disease of the virus yellows type termed 'red leaf'. Both in the field and in greenhouse inoculation experiments at the University of California, Berkeley, the older leaves of diseased plants were reddish, the young leaves dwarfed, erect, and mildly chlorotic, with slightly crinkled, cupped leaflets, and the plants stunted. The effect on the reproductive organs ranged from sterility to complete suppression of floral development. Stunting and dwarfing were usually intensified and a rosette effect sometimes developed. The symptoms generally appeared in 7 to 10 days on young, vigorous plants, although the incubation period may range from

5 to 26 days. The virus was transmitted by *Myzus solani*, *Macrosiphum geranicola*, and *M. solanifolii*, but not by sap inoculation. The aphid vectors experimentally infected the three original hosts and *Geranium dissectum*. The virus was retained in *M. geranicola* for 21 days following removal from the virus source.

LUTTRELL (E. S.). **A key to species of Helminthosporium reported on grasses in the United States.**—*Plant Dis. Reptr, Suppl.* 201, pp. 59–67, 1951. [Multilithed.]

This key to some 45 species of *Helminthosporium* reported on grasses in the United States [cf. *R.A.M.*, 30, p. 420] is derived mainly from Drechsler's descriptions [ibid., 3, p. 65]. The principal criteria employed are the type of germination, shape, insertion of the hilum, wall thickness, colour, size, and septation of the conidia. Notes on some of the species are added.

LUTTRELL (E. S.). **Diseases of tall Fescue grass in Georgia.**—*Plant Dis. Reptr*, 35, 2, pp. 83–85, 1951. [Multilithed.]

Tall fescue grass (*Festuca elatior* var. *arundinacea*) has become the most important permanent grass for winter grazing in Georgia in the Piedmont and the north; in the latter area it is also utilized for summer grazing and hay. In a disease survey in 1949–50, net blotch (*Helminthosporium dictyoides*) [*R.A.M.*, 30, p. 112] appeared to be the most important disease during the late winter and early spring, causing up to 90 per cent. leaf infection in some plantings. However, estimates of damage varied from only a trace to 5 per cent. Spot blotch (*H. sativum*) [loc. cit.] was of minor importance. During the summer of 1949 *Rhizoctonia* leaf blotch (*R.* [*Corticium*] *solani*) was serious throughout the State, causing reductions in leaf area from 10 to 40 per cent. The perfect state [ibid., 22, p. 372] was found in several localities. During the dry summer of 1950 the disease was much less abundant. *Cercospora* leaf spot (*C. festucae*) [ibid., 30, p. 274] was widespread in the summer of 1950. Although as many as 20 per cent. of the leaves were infected in some pastures, only negligible damage was recorded, as there were only a few spots per leaf. In nurseries at Experiment and Tifton, however, some plants had 90 per cent. infected leaves and damage was estimated at 20 per cent. Nitrogen deficiency was frequently encountered. Other minor diseases were white mould (*Sclerotium rolfsii*) and crown rot associated with various fungi.

SPRAGUE (R.). **Some leafspot fungi on western Gramineae. V.**—*Mycologia*, 42, 6, pp. 758–771, 1 fig., 1950.

This is a further annotated list of fungi causing leaf spots on Gramineae in the western United States [cf. *R.A.M.*, 29, p. 101; 30, p. 420]. It includes two new species and the new genus *Viscomacula*, differing from *Rhynchosporium* in the appreciably thicker mycelial pad and in the gelatinous spore masses. *V. aenea* n.sp. is found on living leaves of *Poa ampla*. Other records include *Septoria tritici* on dead leaves and sheaths of rye [ibid., 30, p. 262] and *S. avenae* [*Leptosphaeria avenaria*: ibid., 30, p. 324] on leaves of *Calamagrostis avenae*.

FISCHER (G. W.). **Some new grass smut records from the Western States. II.**—*Mycologia*, 43, 1, pp. 67–77, 1 fig., 1951.

New host and State records are given for a large number of smuts on grasses from the western United States [cf. *R.A.M.*, 17, p. 825; 30, p. 432]. New host records include *Urocystis agropyri* on *Agropyron inerme*, *A. subsecundum* var. *andinum*, *Elymus macounii*, *Phleum alpinum*, *Poa canbyi*, *P. nervosa*, and *P. secunda*; *Ustilago bullata* [ibid., 27, p. 240] on *Bromus macrostachys*; *U. spegazzinii* var. *agrestis* on *A. caninum*, *A. dasystachyum*, *A. riparium*, *A. sibiricum*, *E. glaucus*, and *Oryzopsis hymenoides*; *U. striiformis* on *Agrostis humilis*, *A. rossae*, *A. scabra*,

B. ciliatus, *Calamagrostis scribneri*, *Deschampsia atropurpurea*, *D. caespitosa*, *Festuca idahoensis*, *F. ovina* var. *brachyphylla*, *Koeleria cristata*, *Melica spectabilis*, *Muhlenbergia montanensis*, *Phleum alpinum*, *Poa alpina*, *P. reflexa* (a new record for North America), *Puccinella nuttalliana*, and *Trisetum spicatum*; and *U. williamsii* on *Stipa columbiana* and *S. williamsii*. *U. aculeata* is newly recorded in eight States.

Bollard (E. G.). **Studies on the genus Mastigosporium. I. General account of the species and their host ranges. II. Parasitism.**—*Trans. Brit. mycol. Soc.*, 33, 3–4, pp. 250–264, 265–275, 5 figs., 2 graphs, 1950.

A study was made at the Botany School, Cambridge, of British isolates of *Mastigosporium album* [*R.A.M.*, 18, p. 33] from *Alopecurus pratensis*, *M. rubricosum* [ibid., 29, p. 551] from *Dactylis glomerata* (three strains), *M. rubricosum* var. *agrostidis* n.var. from *Agrostis stolonifera*, and *M. cylindricum* [ibid., 19, p. 414], a new record for Great Britain, from *Phleum nodosum*. In culture on *D. glomerata* extract agar all the isolates produced brown colonies with scarcely any aerial hyphae. Conidia were produced in a moist, slimy pile in the centre of each. The mean diameters of 50 colonies of *M. album*, *M. rubricosum* and its var. *agrostidis*, and *M. cylindricum* after 21 days' growth at laboratory temperatures were, respectively, 10·5, 16·6, 13·55, and 10·79 mm. Small, spherical sclerotia, 200 to 350 μ in diameter, appeared in colonies of *M. album* and *M. rubricosum* and its variety when the cultures were a month old; their appearance was correlated with the onset of cooler weather. In some an ostiole was observed. In dual cultures of strains of this species normal sclerotia only were formed.

Spore lengths of *M. album* from naturally diseased leaves were 47 to 69 (mean 59·6) μ, and from culture 43 to 67 (52·5) μ; of *M. rubricosum* from *D. glomerata* 31 to 59 (42·7) and 33 to 51 (43·3) μ; of its var. *agrostidis* 35 to 45 (40·6) and 35 to 53 (42·4) μ; and of *M. cylindricum* 19 to 27 (23) and 17 to 31 (24·4) μ. The optimum temperature for spore germination and mycelial growth of all species was about 15° C.; at 20° some development occurred but at temperatures above this growth ceased.

In inoculation studies with *M. album* all plants of *Alopecurus pratensis* and *A. geniculatus* were fully susceptible, but all plants of *A. agrestis* were completely resistant. *M. cylindricum* attacked only *P. nodosum* and *P. pratense*. The three isolates of *M. rubricosum* from *D. glomerata* attacked only *D. glomerata* and *D. aschersoniana*. The variety from *Agrostis stolonifera* attacked only its own host, *Calamagrostis canescens*, and *C. epigejos*. *A. canina*, *A. tenuis*, *A. gigantea*, *Trisetum flavescens*, and *P. pratense* were resistant to all isolates of *M. rubricosum*. *M. r.* var. *agrostidis* thus differed from the species in host range and spore lengths, and also in cultural characters, growth rate, and temperature relationships.

The slimy conidia are probably water-dispersed, as they do not withstand desiccation. Spread of the disease is favoured by cool, moist conditions. The fungi probably overwinter and oversummer as viable mycelium in lesions.

In the second paper are reported investigations of the mode of parasitism of *M. album* on *Alopecurus pratensis*, *M. rubricosum* on *D. glomerata*, and *M. r.* var. *agrostidis* on *Agrostis stolonifera*. Penetration is made by the spore germ-tube through the cuticle and outer wall into the cavity of an epidermal cell. Here the hyphae develop extensively and the contents of the adjacent mesophyll cells become disorganized. The hyphae grow into the mesophyll, causing limited necrosis, but do not reach the periphery of the affected part. The lesion is delimited laterally by the sclerenchyma of the parallel leaf veins, while longitudinal extension is probably limited by an accumulation of staling products.

Comparative histological studies of inoculated material showed that there was no penetration by *M. rubricosum* of *A. stolonifera* or by its var. *agrostidis* of *Alopecurus pratensis*, though the spores germinated readily on the leaf surface.

In all the other host-parasite combinations germ-tubes penetrated into the epidermal cells in the same way as on the normal host of each fungus. *A. pratensis*, *D. glomerata*, and *Agrostis stolonifera* were all able to support the growth of *M. album*, *M. rubricosum*, and its var. *agrostidis*. Differences were noted in the ability of any one fungus to grow on extracts of different host species, but these differences failed to account for the ability of that fungus to attack one plant and not others. In some instances a species showed more growth on extracts of a plant it does not attack than on extracts of its usual host. It would appear that the specialized parasitism displayed by these fungi cannot be explained on a basis of their inability to grow on the materials available to them in grasses which they do not parasitize. The reasons for non-lethal attack in most of the inappropriate fungus-host combinations studied seem to lie in the inability of the fungi to secrete toxins sufficient to kill the host protoplasm or to derive adequate nutrients from the tissues.

Starr (M. P.) & Garcés O[rejuela] (C.). **El agente causante de la gomosis bacterial del pasto Imperial en Colombia.** [The causal agent of bacterial gummosis of the Imperial pasture grass in Colombia.]—*Rev. Fac. Agron. Medellín*, 11, 38–39, pp. 73–83, 1950. [English summary.]

A limiting factor in the cultivation of *Axonopus scoparius*, widely used for fodder in Colombia, and of the closely related *A. micay*, is the gummosis caused by a new species of *Xanthomonas* for which the name *X. axonoperis* is proposed.

The morphological, cultural, and biochemical characters of the new bacterium, which presents close analogies with *X. albilineans* [*R.A.M.*, 8, p. 465 *et passim*; cf. also ibid., 28, p. 326], are fully described. It is rod-shaped, motile by means of a single polar flagellum, Gram-negative, aerobic, and measures 1 by 0·4 μ in the gum from infected stems and in old cultures, and 3 by 0·6 μ in young ones, e.g., on a lead acetate or thioglycollate medium. Capsules are formed on most media, being specially prominent in old cultures or on sugar-containing substrata. Endospores were not observed.

On yeast extract agar the growth of the organism was slow and scanty at 5° to 10° C., moderate to good at 15°, 20°, and 25°, and excellent and rapid at 30°; at 37° only two strains developed very slowly and at 43° no growth occurred. Nitrates are not reduced, indole is not produced, and gelatin is not liquefied, but a powerful amylolytic action is exerted. No growth is made on potato dextrose agar at pH 5·2, but most of the cultures developed at 5·8. At 6·6 and 7·6 all made very good growth, forming dense, yellow, mucoid colonies similar to those of other plant-pathogenic species of *Xanthomonas* [ibid., 28, p. 273]. As regards the minimal nutritive requirements of *X. axonoperis* [cf. ibid., 25, p. 292], no growth was made in a basic medium of ammonium, glucose, and salts unless supplemented by 0·5 per cent. casein hydrolysate. The only sugars utilized by the bacterium in these experiments were sucrose, trehalose, and probably dextrose.

Grasso (V.). **Rigenerazione di sferidi in stipiti decapitati di 'Claviceps paspali' Stev. et Hall.** [Regeneration of capitula of decapitated stipes of *Claviceps paspali* Stev. & Hall].—*R. C. Accad. Lincei*, Ser. 8, 8, 2, pp. 146–149, 6 figs., 1950.

When the mature capitulum of a germinated sclerotium of *Claviceps paspali* [*R.A.M.*, 29, p. 567] was cut off, the wounded part of the stalk became covered after a few days with a pale, very loose mycelium, later becoming ochraceous and compact. A new, apparently normal capitulum developed. After a few weeks, when the perithecia appeared mature, the new capitulum grew away from the cicatrized part on a short peduncle.

Fritsche (H.). **Einige dieses Jahr häufig auftretende physiologische Störungen bei Kernobstbäumen.** [Some physiological disturbances frequently affecting pome fruits this year.]—*Schweiz. Z. Obst- u. Weinb.*, 59, 17, pp. 312–315, 3 figs., 1950.

Three physiological disorders have been of frequent occurrence on apples in Switzerland in 1950. Fissures developed on the growing fruits after sudden changes from a dry to a wet spell.

Sun scorch causes necrosis of the outer cell layers on the exposed portions of apple and pear fruits. The resultant circular, brown lesions later become sunken and often corky. The condition is more prevalent on sprayed than on untreated fruits.

The light brown, slightly raised spots scattered through the flesh of apples, notably of the Berner Rosen, Glocken, Danziger Kant, and Sauergrauech varieties, are of uncertain origin, but in most cases they accompanied internal cork, associated with temporary deficiency of boron [*R.A.M.*, 29, p. 314], which could not be adequately assimilated from the soil under the prevailing dry conditions. When winter and spring rainfall is low, borax at the rate of 5 to 10 gm. per sq. m. should be applied in the late winter to the area covered by the tree canopy. The uniform distribution of these small quantities will be facilitated by the admixture with the borax of a tenfold quantity of sand, superphosphate, or potash salt.

Ghillini (C. A.). **Sulle cause di una dannosa alterazione delle Mele.** [On the causes of a noxious deterioration of the Apple.]—*Riv. Frutticolt.*, 10, 3, pp. 81–87, 1948. [Abs. in *Biol. Abstr.*, 24, 9, 28125, 1950.]

Apples of the 1947 crop in storage in Italy developed a disease attributed to *Peyronellaea* [*Phoma*] *veronensis*. The fungus is favoured by moist, warm conditions and deficient sunlight.

Aycock (R.). **Some nuclear phenomena in Physalospora obtusa.**—*Phytopathology*, 41, 5, pp. 459–465, 1 fig., 1951.

Perithecia of *Physalospora obtusa* have been found in profusion in the bark of dead apple branches in North Carolina orchards since 1946 [cf. *R.A.M.*, 4, p. 178]. The chromosome number in the primary ascus nucleus is probably n = 10. The third nuclear division in the young ascus is followed by an unusual type of ascospore maturation. The eight young ascospores, spherical when first delimited, soon undergo rapid elongation but do not expand in width until they measure about 20 by 3 μ. Several consecutive nuclear divisions accompany the process of elongation and widening, culminating in a multinucleate condition of the mature spores. The originally uninucleate conidia also become multinucleate at maturity, and more than one nucleus has been found in the hyphal cells of the mycelium.

Sprague (R.). **Apple powdery mildew spray trials at the Tree Fruit Station in 1949.** —*Proc. Wash. St. hort. Ass.*, 45, pp. 47–50, 2 graphs, 1949. [Received March, 1951.]

In trials at the Tree Fruit Station [Washington] in 1949 for the control of apple powdery mildew [*Podosphaera leucotricha*: *R.A.M.*, 29, p. 264] on Jonathan and Black Jonathan, applications were combined with the usual pink, calyx, and four cover sprays. Good control (about 15 per cent. twig infection) was obtained with 2·5 per cent. lime-sulphur in the first spray and 2 per cent. in the second, followed by sulphur or 1 lb. arathane in the cover sprays. Good control was also obtained with arathane for all six applications, with kolodust for the first two, and with CR 305 (1 lb. for the first two, and 2 lb. for the cover sprays). Six applications of zerlate (2 lb.) plus mike sulphur (2 lb.) gave the best control (about 8 per cent.), but the combination is too expensive ($1.62 per 100 gals.) and caused some burning of the fruit. Untreated plants developed almost 50 per cent. infection.

Stanton (W. R.). **The use of thin polythene sleeving for moist chambers in inoculation studies.**—*Phytopathology*, 41, 5, pp. 476–477, 1 fig., 1951.

At the John Innes Horticultural Institution, Bayfordbury, Hertfordshire, England, 5-in.-diameter polythene (polymerized ethylene) film, supplied by Imperial Chemical Industries (Plastics Division), was tested in 1948 and 1949 for the enclosure of separate shoots of potted pear trees in moist chamber studies, in the field and greenhouse, of strain × variety interactions in relation to the pear scab fungus (*Venturia pirina*). A spiral of aluminium supported the sleeve, the top and bottom of which were closed with aluminium wire, a cotton wool plug round the branch at the lower closure permitting gaseous exchange. The sleeves could be washed with strong detergents and sterilized with sodium hypochlorite.

More recently a proprietary brand of polythene extruded in tube form, 4-in. diameter and 0·0015 in. thickness, has been used in the greenhouse with satisfactory results.

Wolfe (H. R.), Anthon (E. H.), & Jones (L. S.). **Insect transmission of western X-disease of Peaches.**—*Science*, 113, 2941, pp. 558–559, 1951.

These studies on western X-disease of peaches [? strain of peach X-virus] in the United States have already been noticed from another source [*R.A.M.*, 30, p. 277].

Ramsey (G. B.), Smith (M. A.), & Heiberg (Barbara C.). **Anthracnose of Peaches.**—*Phytopathology*, 41, 5, pp. 447–455, 1 fig., 1 graph, 1951.

Since 1947, when anthracnose (*Glomerella cingulata*) was recognized as an important disease of Georgia-grown peaches on the market [*R.A.M.*, 29, p. 513], increasing amounts of infection have been observed in Georgia and Carolina orchards and in shipments from the two States. About 90 per cent. of the isolates from typical lesions developed greyish-green colonies on potato dextrose agar and the remainder were pink [cf. ibid., 30, p. 375]. The former produced the ascigerous state in culture and in inoculated peaches, whereas the latter never did so. The grey isolates grew faster in culture above 50° F. and caused more rapid decay of the fruits above 60° than did the pink ones. The pink isolates developed more rapidly in culture below 50° and produced more extensive fruit-rotting below 60° than did the grey ones. The optimum temperature for both types is 80°.

Hard-ripe and firm-ripe peaches readily contract infection by inoculation through wounds, by the application of mycelium to intact tissue, and by spraying the fruits with an aqueous spore suspension. The results of tests on the transportation of commercial carloads of peaches from South Carolina to Chicago under standard refrigeration showed that inoculation through wounds produced lesions $\frac{1}{2}$ in. in diameter in three days, while those consequent on spraying with a spore suspension measured $\frac{1}{16}$ to $\frac{1}{8}$ in. in diameter. It was evident from all the experimental data that during transport there is a risk of serious anthracnose development through wounds inflicted during harvesting and packing and through spore contamination in seasons when infection is rife in the orchards.

Powell (D.). **Phygon XL for the control of Peach blossom blight.**—*Plant Dis. Reptr*, 35, 2, pp. 76–77, 1951. [Multilithed.]

Experiments conducted in 1949 and 1950 in Illinois demonstrated that sprays containing phygon XL were superior to other treatments in controlling peach blossom blight and brown rot infection caused by *Sclerotinia fructicola* [*R.A.M.*, 29, pp. 159, 417; 30, pp. 173, 328]. In 1949 the treatment on Red Bird consisted of liquid lime-sulphur plus sulphur paste (1 gal. plus 4 lb. per 100 gals. water) at the pink bud stage, followed at the early bloom stage by various fungicides. At the

end of April the number of blossoms showing conidia among 100 selected at random from each tree were recorded. The numbers for those given the early bloom application of fungicide were: phygon (½ lb. per 100 gals.) 5·8, ferbam (1 lb.) 13·7, bioquin 1 (¼ lb.) plus sulphur (3 lb.) 14·9, CR 305 (1 lb.) 15·4, and for the controls not receiving the second spray 28.

In 1950 Elberta trees were given one spray of phygon XL (¼ lb.) plus wettable sulphur (3¼ lb.), or wettable sulphur alone (8 lb.) during the early to full bloom period; the mean blossom infection and the number of blight cankers per 100 twigs on 12th May were, respectively, 1 and 2·6 for the first treatment, 7 and 5 for the second, and 15·1 and 7·1 for the untreated. Percentage fruit infection on 24th July and 8th and 14th August was 1·45, 7, and 6·4 for phygon plus sulphur and 2, 11, and 17 for sulphur alone, respectively. The untreated trees had lost all their fruit by 24th July. Canker abundance early in the season had a definite bearing on the severity of fruit infection at harvest.

Young (H. C.). **Indexing hosts for Sour-Cherry ring-spot and yellows.**—*Phytopathology*, 41, 5, pp. 479–480, 1951.

In comparative indexing tests in the greenhouse at the New York (Geneva) Agricultural Experiment Station *Prunus tomentosa* on peach roots proved to be an excellent host for the detection of the cherry necrotic ring spot virus [*R.A.M.*, 30, p. 329], whereas the reaction to the cherry yellows virus [loc. cit.] complex was not diagnostic. No symptoms developed on *P. cistena* but the necrotic ring spot virus was transmitted through *P. cistena* to the peach roots. Some evidence was obtained indicating that *P. cistena* transmits only the ring spot component of the cherry yellows virus complex.

Carman peach trees inoculated with the necrotic ring spot virus developed striking mottle and ring patterns, while the yellows virus induced the same symptoms with the addition of rosette. Contrary to Berkeley's observations in Ontario [ibid., 26, p. 203], the Rochester variety was erratic in symptom expression, as also was J. H. Hale. Triogem, an excellent diagnostic host of the two above-mentioned viruses in the greenhouse [ibid., 29, p. 498] in subsequent field experiments developed no rosette symptoms following inoculation with yellows, suggesting that their appearance may be influenced by environmental factors.

Mills (W. D.) & Van Geluwe (J. D.). **Field evaluation of glyoxalidine compounds for control of Cherry leaf spot.**—*Phytopathology*, 41, 5, pp. 466–474, 1951.

Excellent control of cherry leaf spot (*Coccomyces hiemalis*) was obtained in four years' trials (1946 to 1949) in New York State with 2-heptadecyl-glyoxalidine in various forms [*R.A.M.*, 30, p. 326]. Particularly good results were given by a dry wettable powder, 341–B (containing 33 per cent. toxicant), in a more finely divided form than the commercial grade. Applied at a dosage of 2 and 1½ lb. per 100 gals. (equivalent to ⅔ and ½ lb. toxicant), it reduced the incidence of infection from 66·6 to 14·9 and 17·3 per cent., respectively, on an Orange County farm in 1949; the corresponding figures for cupro-K (3 lb.) and fermate (1½ lb.) were 45·2 and 18·8, respectively. In the same year the fruit on the trees sprayed with 341-B was highest in solids in solution [ibid., 30, p. 172]. Solution 341–C was highly effective in leaf spot control but caused severe injury to the fruit.

Glyoxalidine possesses outstanding protective properties but does not eradicate infection in the same way as the low-soluble copper sprays. Therefore, unless the treatments are correctly timed on a protective schedule, as was the case in these trials, the copper sprays would be likely to give better control than the glyoxalidines.

Miller (P. W.). **An eastern Oregon Fragaria vesca suitable as an indicator for some Strawberry virus diseases.**—*Plant Dis. Reptr*, 35, 2, pp. 61–62, 1 fig., 1951. [Multilithed.]

Of various wild strawberry plants [*R.A.M.*, 21, p. 380; 29, p. 266] tested for sensitivity to yellows [yellow edge] and crinkle viruses, one collected in eastern Oregon proved a good indicator for these diseases. Vigorous plants incubated at 65° to 75° F. showed visible symptoms of yellow edge ten days to a fortnight after viruliferous aphids had fed on them; in a month to six weeks the plants were dead or dying.

Breakey (E. P.) & Campbell (L.). **Suppression of Strawberry yellows by controlling the aphid vector Capitophorus fragaefolii (Ckll.).**—*Plant Dis. Reptr*, 35, 2, pp. 63–69, 1951. [Multilithed.]

Strawberry yellows [yellow edge] virus [see preceding abstract] has become the limiting factor in the production of the Marshall variety [*R.A.M.*, 28, p. 69] in the Pacific Northwest. The expansion of strawberry acreage in Western Washington was followed by a marked increase of the disease, causing yield reductions up to 75 per cent. [ibid., 29, p. 516]. The use of certified stock supplemented by roguing proved ineffective.

Field trials carried out from 1947 to 1950 at the Western Washington Agricultural Experiment Station demonstrated that parathion, tetraethyl pyrophosphate, and gammexane (all at 1 per cent. and 8 to 10 lb. per acre) adequately controlled the strawberry aphid (*Capitophorus fragaefolii*) [*C. fragariae*] and prevented the spread of yellow edge. In 1949, for example, a mature planting with 10 to 15 per cent. yellow edge at planting time had 9·5 to 13·37 per cent. in September, compared with 75 per cent. in undusted commercial fields. In an isolated dusted and rogued planting infection was kept down to between 0·47 and 1·67 per cent. Dusting mature fields early in the season, when the plants started to blossom, effectively reduced the aphid population without leaving a poisonous residue on the fruits, and prevented the development of migratory alatae. Infection in new plantings was prevented by fortnightly dusting, beginning about one week after setting the plants and continuing until the harvest had been completed, supplemented by early roguing.

Bush fruits.—*Bull. Minist. Agric., Lond.*, 4, 36 pp., 12 pl., 1 fig., 1951. 2*s*.

Details are given of general considerations in growing black and red currants and gooseberries, including notes on varieties and disease control. The gooseberry variety Keepsake (Berry's Early Kent) is susceptible to American gooseberry mildew [*Sphaerotheca mors-uvae*: *R.A.M.*, 25, p. 74], while Lancashire Lad is fairly resistant. Appendix I outlines the measures enforced against *S. mors-uvae* by the Sale of Diseased Plants Orders, 1927–43, and Appendix II outlines the Sale of Strawberry Plants and Black Currant Bushes Order, 1946 [ibid., 25, p. 288].

Mauzé (J.) & Merny (G.). **Une nouvelle maladie du Bananier en Guadeloupe, la 'Javanese disease'.** [A new disease of the Banana in Guadeloupe, 'Javanese disease'.]—*Rev. Path. vég.*, 29, 3, pp. 165–167, 1950.

Banana plants growing at Neufchateau, Guadeloupe, recently developed symptoms of a disease apparently new to the West Indies. They reached only half the normal height, the crown was reduced to seven or ten leaves, and many withered leaves hung down near the fruit. The fruit stalk was weak and the fruits were of poor quality and failed to ripen properly. In the base the vascular bundles were yellow, brown, red, or violet, and it emitted a viscous liquid. From affected material the authors isolated a non-sporulating, Gram-positive, non-motile,

rod-shaped bacterium 0·8 to 1·2 (μ) long, considered to be identical with *Bacterium musae* [*R.A.M.*, 7, p. 308], which has recently been renamed *Corynebacterium musae* by Magrou.

Chowdhury (S.). **A fruit rot of Papaya (Carica papaya L.) caused by Ascochyta caricae Pat.**—*Trans. Brit. mycol. Soc.*, 33, 3–4, pp. 317–321, 1 pl., 1 fig., 1950.

Papaw fruit rot (*Ascochyta caricae*) [*R.A.M.*, 28, p. 246] is serious and widespread in almost all the chief papaw-growing parts of Assam. It was first observed at the Burnihat Fruit Research Station in July, 1944, and has since recurred every year in a severe form during the rains. A survey of the Cachar district and in the North Cachar Hills showed 10 to 15 per cent. of the fruits to be affected on the trees.

The disease generally attacks half-grown or mature fruits. Small, circular, watersoaked spots up to $\frac{1}{2}$ in. across appear and slowly enlarge. After five to eight days, according to the temperature and humidity conditions, the lesion may be 3 in. in diameter, sunken, and brownish-black. The rot usually spreads outwards irregularly. The spots tend to occur in groups and in advanced stages may coalesce. Rotting was most severe at 30° C. and 100 per cent. humidity. Serious infection may develop in harvested fruits.

On the fruits and in culture the pycnidia measured 85 to 218 by 65 to 192 (average 130 by 114) μ and the bicellular pycnidiospores 7 to 12 by 3 to 4 μ. Pathogenicity was proved by inoculation and reisolation. Experimental evidence demonstrated that the disease can be controlled by spraying the fruits with Bordeaux mixture (2–2–50) [cf. loc. cit.] at intervals of 21 to 30 days, maintaining good coverage from the time of setting.

Kreutzer (W. A.), McBeth (C. W.), Turner (M.), Bergeson (G. B.), & Whetstone (R. R.). **The fungicidal and nematicidal properties of dibromobutene.**—*Science*, 113, 2945, pp. 657–658, 1951.

A volatile material with a relatively low vapour pressure, applicable directly to soil surfaces and capable of destroying fungi in the upper 2 in. zone, has been discovered at the Shell Agricultural Laboratory, Emeryville, California. It is a white, crystalline solid, *trans*-1,4-dibromobutene-2. In preliminary screening trials in closed glass containers, dissolved in iso-octane, acetone, or similar diluents, it was lethal to conidia and mycelium of *Fusarium solani* [f.] *pisi* and *Verticillium albo-atrum* at 0·002 gm. per l. of space after 24 hours' exposure at 21° C. As a dust at 10 and 20 per cent. by weight in talc it was mixed with soil in a rotating drum for greenhouse tests or spread with a garden rake in the field, while for deeper applications an Ariens tiller was employed. No soil seals were used. In tests on *Pythium ultimum*, *Rhizoctonia* [*Corticium*] *solani*, and *Fusarium-Pythium* complex, naturally infested field soil was used; *Sclerotium rolfsii* was introduced into the soil. Complete control of *S. rolfsii*, as estimated by the reduction in viability of the sclerotia, was obtained at 1 to 2 gm. per sq. ft. (surface treatment) or 2 to 4 gm. per cu. ft. (complete mix) in the greenhouse, the corresponding figures for the field being 100 to 200, and 150 to 200 lb. per acre.

In the greenhouse 0·5 to 2 per cent. resulted in complete control of damping-off peas and sugar beets by *P. ultimum*, while 50 to 100 lb. per acre gave nearly complete control in the field. Basal stem rot of beans [*Phaseolus vulgaris*] was completely controlled by a dose of 0·5 to 1 gm. per sq. ft. in pots. Nearly complete control of the *Fusarium–Pythium* complex, causing seedling rot and blight of peas, was secured by mixing 0·5 to 3 per cent. per cu. ft. in greenhouse beds.

At fungicidal levels the chemical was not particularly toxic to crop seeds, even

when applied at sowing-time, provided water was withheld for 24 hours after treatment and planting.

FREAR (D. E. H.). **Pesticide handbook.**—158 pp., Pennsylvania State College, Commercial Printing, Inc., 1951. $1.

This handbook, which is a continuation and expansion of 'Pest Control Materials' [*R.A.M.*, 28, p. 344], includes details of the trade names, manufacturers, composition, and application of nearly 4,000 pesticide materials produced in Canada and the United States for use in 1951. Information concerning adjuvants, diluents, repellents, plant hormones, and application machinery is included for the first time. A tabular guide to the compatibility of common spray materials is appended.

LUNDEGÅRDH (H.). **Leaf analysis.**—viii+176 pp., 3 pl., 7 figs., 2 diags., 32 graphs, London, Hilger & Watts, Ltd. (Hilger Division), 1951. 22*s.* 6*d.*

This is the authorized translation by R. L. MITCHELL of the author's 'Die Blattanalyse', published in Germany in 1945. The monograph presents some of the practical results obtained in 20 years' investigations at the Plant Physiology Institute, Uppsala-Ultuna, Sweden, of the laws regulating the uptake of nutrients by plants. Spectrographic methods were employed, and an automatic spectroanalytical apparatus specially designed to deal with leaf analysis and many other problems involving serial analyses is described. The first chapter (pp. 1–103) deals with the scientific principles of leaf analysis, chapter 2 (pp. 104–147) with the practical basis of leaf analysis, and chapter 3 (pp. 148–164) with the application of leaf analysis to the determination of the manurial requirement of the soil. The list of reading references extends to eight pages. The book should prove useful to workers in applied botany, especially to those interested in mineral deficiencies in plants.

LIMASSET (P.) & DARPOUX (H.). **Principes de pathologie végétale. Notions sur les principales maladies parasitaires des plantes cultivées. 2e édition.** [The principles of plant pathology. An elementary guide to the chief parasitic diseases of cultivated plants. 2nd edition.]—viii [x]+334 pp., 141 figs., 1 diag., 6 graphs, Paris, Dunod, 1951.

This revised and enlarged edition [*R.A.M.*, 25, p. 5] includes the results of investigations carried out by various workers in the United States and Great Britain since 1940, which were not available in France when the original edition appeared. Disease transmission, immunity, and epidemiology are treated at greater length, a chapter on chemical control has been added, and the number of diseases considered has been greatly increased. Most of the matter dealing with new diseases is by H. Darpoux, who is also responsible for the parts dealing with the application of control methods and the damage caused by various products.

Advances in agronomy. Volume II.—xi+407 pp., 12 figs., 9 diags., 14 graphs, 3 maps, New York, Academic Press, Inc., 1950.

The present publication [cf. *R.A.M.*, 30, p. 54], edited by A. G. NORMAN, contains matter of phytopathological interest in the sections on cotton (diseases, pp. 26–32, by J. T. PRESLEY), on vegetable production by J. E. KNOTT and O. A. LORENZ (resistance to disease, pp. 122–127), ladino clover by G. H. AHLGREN and R. F. FUELLEMAN (diseases, p. 213), and preservation and storage of forage crops by R. B. MUSGRAVE and W. R. KENNEDY (mouldiness of silage, p. 281). In the section on forage crops it is stated that an [unspecified] mouldy condition in silage indicates that large losses of nutrients have occurred. Slightly mouldy silage may not affect cattle, but sheep and horses may suffer from it.

Weiss (F.). **Index of plant diseases in the United States. Part III Gramineae.**—*Spec. Publ. Plant Dis. Surv.* 1, part III, pp. 382–529, 1950.

Part III of this Index [cf. *R.A.M.*, 30, p. 112] contains the lists of diseases occurring on Gramineae in the United States [cf. ibid., 29, p. 101; and above, p. 472].

Perotti (R.). **Biologia vegetale applicata all' agricoltura. IV, B. Microbiologia delle industrie.** [Plant biology applied to agriculture. IV, B. Industrial microbiology.] Second edition.—849 pp., 6 col. pl., 147 figs. (5 col.), 31 graphs, 1 diag., 3 maps, Turin, Rosenberg & Sellier, 1951. Lire 8,000 (in Turin), 8,250 (elsewhere in Italy), or $13.50 (abroad).

This concluding volume of the present work [*R.A.M.*, 27, p. 574] deals mainly, and at length, with various aspects of fermentation [ibid., 30, p. 182], including the morphology, systematics, and physiology of the fungi involved, alcoholic fermentation, preservation of agricultural produce by means of fermentation, fermentation in relation to wine- and beer-making, acetic acid, lactic acid, milk, bread-making, and distilling. A chapter on the cultivation of edible fungi (pp. 771–803) is included.

Tervet (I. W.), Rawson (A. J.), Cherry (E.), & Saxon (R. B.). **A method for the collection of microscopic particles.**—*Phytopathology*, 41, 3, pp. 282–285, 1 fig., 1 diag., 1951.

Details are given of the construction of the cyclone separators developed at Camp Detrick, Frederick, Maryland, for the collection and dissemination of dry microscopic particles, including fungus spores larger than 4 μ, from the air or direct from plants or cultures, the basic mechanism of which has already been noticed [*R.A.M.*, 30, p. 114 and above, p. 460].

Duddington (C. L.) & Dixon (Sylvia M.). **Permanent preparations of fungi growing on agar.**—*Nature, Lond.*, 168, 4262, pp. 38–39, 1951.

Methods are described for making preparations of predacious fungi from agar cultures, where it is important that hyphae should be retained *in situ*. A rapid method, excellent for mycelium and thick-walled spores, is to slice off the mycelium-bearing surface (200 μ thick) from agar blocks about 4 mm. square cut from the cultures, fix in absolute alcohol for one minute, and stain in a saturated methyl alcohol solution of chlorazol black E [*R.A.M.*, 24, p. 199] for one second, followed by dehydration and mounting in euparal in a cavity slide.

If the thickness of the agar is a disadvantage the agar blocks are fixed for at least 24 hours in a mixture of 10 ml. commercial formalin, 5 ml. glacial acetic acid, and 85 ml. distilled water. The block is washed until it no longer smells of acetic acid and stuck surface downwards on a No. 1 cover-slip with Szombathy's gelatin. The agar is allowed to dry in a warm place (not over 35° C.) until it starts to shrink. When firmly attached to the cover-slip the block is sliced away as close to the glass as possible. The material on the glass is then stained with Heidenhain's haematoxylin and mounted in Canada balsam or euparal.

Duly (S. J.). **The ventilation of ships' holds.**—*J. R. Soc. Arts*, 98, 4825, pp. 710–725, 5 figs., 3 diags., 1950.

The author discusses fully the problem of ventilating the holds of dry-cargo vessels [*R.A.M.*, 30, p. 169] from the point of view of eliminating the deposition of moisture emanating from the cargo itself or due to the temperature and humidity prevailing on board [and controlling mould damage]. A description is given of the motor-driven fan method developed by the Cargocaire Engineering Corporation, Seattle, Washington, and various later methods including those employing silica

gel and lithium chloride as drying agents, the adaptation of refrigeration to air-drying, and the use of brine grids. Specific recommendations are given for ventilating cargoes of wheat, maize, and fruit.

Siminoff (P.) & Gottlieb (D.). **The production and role of antibiotics in the soil.**—*Phytopathology*, 41, 5, pp. 420–430, 1 graph, 1951.

This is an expanded account of studies on the antagonistic effect of a streptomycin-producing strain and a non-productive mutant of *Streptomyces griseus* on *Bacillus subtilis* (both indigenous in Illinois soils), a preliminary note on which has already appeared [*R.A.M.*, 29, p. 374].

Gottlieb (D.), Bhattacharyya (P. K.), Carter (H. E.), & Anderson (H. W.). **Endomycin, a new antibiotic.**—*Phytopathology*, 41, 5, pp. 393–400, 1951.

A new antibiotic, designated endomycin, has been isolated from cultures of an unidentified species of *Streptomyces* from soil collected in the Cache River Valley, Illinois. Both the acid and salt have been extracted and found to be stable to heat, acid, and alkali. Endomycin is soluble in alcohols but insoluble in most other organic solvents and in water. The numbers of endomycin units (a unit being defined as the minimum amount of antibiotic per ml. which would inhibit the growth of *Torula* [*Torulopsis*] *utilis* for 24 hours in Emerson's medium) exerting a fungistatic action on *Sclerotinia fructicola*, *Rhizoctonia* [*Corticium*] *solani*, *Glomerella cingulata*, *Macrosporium* [*Stemphylium*] *sarciniforme*, *Colletotrichum phomoides*, *Fusarium* [*bulbigenum* var.] *lycopersici*, and *Agrobacterium* [*Bacterium*] *tumefaciens* were 1 to 5, 25, 25, 25, 25, 25 to 50, and 10, respectively.

Klöpping (H. L.) & Van der Kerk (G. J. M.). **Antifungal agents from the bark of Populus candicans.**—*Nature, Lond.*, 167, 4259, pp. 996–997, 1951.

In further studies at the Institute for Organic Chemistry, Utrecht, Holland, two highly fungistatic compounds were extracted from the bark of poplar (*Populus candicans*) [*R.A.M.*, 29, p. 422]. One completely inhibited the growth of *Botrytis cinerea*, *Penicillium italicum*, *Aspergillus niger*, and *Rhizopus nigricans* [*R. stolonifer*] in roll-culture tests (*Antonie van Leeuwenhoek J. Microbiol. Serol.*, 16, p. 282, 1950) [*R.A.M.*, 27, p. 489] at a concentration of 100 p.p.m., and in the slide germination test at 250 p.p.m. This substance is similar to benzyl gentisate, which shows the same anti-fungal activity. The other substance completely inhibited the spore germination of *P. italicum* in the slide germination test at a concentration of 45 p.p.m.

Köhler (H.). **Antibiotika und ihre Bedeutung in der Pflanzenpathologie.** [Antibiotics and their importance in plant pathology.]—*NachrBl. dtsch. PflSch-Dienst, Berl.*, N.F., 4, 9, pp. 161–164; 10, pp. 185–193, 1950.

The author reviews the present knowledge of antibiotics, with special reference to their effect on bacterial and fungal plant pathogens. A bibliography of 64 titles is appended.

Munn (M. T.) & Buchholz (A. B.). **The quality of seeds on sale in New York in 1950.**—*Bull. N.Y. St. agric. Exp. Sta.* 746, 80 pp., 13 figs., 1951.

Field planting tests at New York Agricultural Experiment Station of 30 samples of spring barley and 131 of oats offered for sale in New York in 1950 showed the following seed-borne diseases to be present [cf. *R.A.M.*, 30, p. 101]: on barley *Helminthosporium* blight (*H. sativum*), 0·5 to 11 per cent. infection per sample; scab (*Gibberella zeae*), 0·1 to 2 per cent.; loose smut (*Ustilago nuda*) and false loose smut (*U. nigra*), 0·1 to 7·2 per cent.; and covered smut (*U. levis*) [*U. hordei*], 0·2 per cent.; and on oats, covered smut [*U. kolleri*], 1·5 per cent. and scab [*G. zeae*],

0·5 to 4 per cent. Loose smut, especially true loose smut, was the most serious of these diseases, only four samples of barley being unaffected. *H. sativum* was found in 12 samples of barley and scab in three, while 32 samples of oats developed scab. Covered smut was found in one sample of barley and one of oats.

Ames (L. M.). **New species of cellulose decomposing fungi. III.**—*Mycologia*, 43, 1, pp. 29–33, 7 figs., 1951.

In further studies at the Engineer Research and Development Laboratories, Fort Belvoir, Virginia, on cellulose-decomposing fungi [cf. *R.A.M.*, 30, p. 183] two new species of *Ascotricha* were isolated. *A. xylina*, dominant on cotton duck from Manila, has globose to subglobose perithecia measuring 80 to 120 by 75 to 100 μ, with a distinct neck, extruding spores into the slender, branched terminal hairs as a black mass or frequently in cirrhi; the delicate, linear, cylindrical, 8-spored asci measure 47 by 8·5 μ. The monostichous ascospores when mature are dark olive-brown, ovate, and measure 8 to 10·5 by 6·5 to 8 μ, and when seen edgewise 4·5 to 5·25 μ. The smooth, pear-shaped conidia measure 5 by 3·5 to 4 μ.

A. guamensis, isolated from cardboard boxes stored in an army warehouse in Guam, has globose to subglobose perithecia measuring 75 to 110 by 60 to 90 μ, with a short thick neck through which spores are extruded into the stiff, branched terminal hairs as a black mass or frequently in cirrhi. The delicate, linear, cylindrical, 8-spored asci measure 68 by 8 μ. The ovate monostichous ascospores, dark olive-brown when mature, measure 8 to 10 by 7 to 9 μ, and when seen edgewise 4 to 5 μ. The smooth, pear-shaped conidia are 6 by 3 to 4 μ.

Reese (E. T.) & Downing (Mary H.). **Activity of the Aspergilli on cellulose, cellulose derivates, and wool.**—*Mycologia*, 43, 1, pp. 16–28, 1951.

In further work at the United States Army Quartermaster Laboratory, Philadelphia [cf. *R.A.M.*, 30, p. 115], a study was made of the activity on cellulose and autoclaved wool of 422 isolates of *Aspergillus* obtained from deteriorating materials [cf. ibid., 29, pp. 375, 473]. The results showed that the isolates of any particular species of *Aspergillus* were alike in their ability to attack a particular substratum. *A. terreus*, *A. fumigatus* [ibid., 30, p. 39], and *A. flavipes* were the only groups active on both bleached cotton sheeting and wool. *A. clavatus*, *A. flavus-oryzae* [loc. cit.], *A. tamarii*, *A. ochraceus*, *A. nidulans*, and *A. rugulosus* were all active on wool and inactive on sheeting, while the last three were active on grey cotton duck also. *A. ustus* group was inactive on wool and sheeting but active on duck. *A. unguis* was active on wool only. *A. wentii* [ibid., 27, p. 486], *A. versicolor*, *A. glaucus*, and *A. niger* groups were inactive on both wool and cellulose with the exception of *A. luchuensis* [loc. cit.] on duck. Thus there is a close relationship between activity and morphology. Exceptional behaviour is suggestive of contamination or misdetermination. All members of the genus *Aspergillus* appear to be capable of hydrolysing the 1,4β-glucosidic linkages in the cellulose chain.

Moreau (F.). **Les associations mycorrhiziennes des arbres forestiers.** [The mycorrhizal associations of forest trees.]—*Terre et la Vie*, 98, 2, pp. 93–104, 1951.

In this general account of the mycorrhizal associations of forest trees [cf. *R.A.M.*, 28, pp. 189, 411; 29, p. 526; 30, pp. 61, 282] the author treats briefly the morphology of mycorrhiza, factors favouring their development, the kinds of trees and the fungi that form these associations, and the features of the symbiosis.

Rawlings (G. B.). **The mycorrhizas of trees in New Zealand forests.**—*For. Res. Notes*, 1, 3, pp. 15–17, 1951. [Mimeographed.]

A list is presented of the fungi known or believed to form mycorrhiza with 12 tree species in New Zealand [*R.A.M.*, 17, p. 847].

Norkrans (Birgitta). **Studies in growth and cellulolytic enzymes of Tricholoma with special reference to mycorrhiza formation.**—*Symb. bot. upsaliens.*, 11, 1, 126 pp., 2 pl., 64 graphs, 1950.

Two earlier papers [cf. *R.A.M.*, 29, p. 44] are incorporated in this report of pure culture studies begun in 1941 at the Institute of Physiological Botany, University of Uppsala, Sweden, on the physiology of litter-decomposing *Tricholoma* spp. and those forming ecto- and ectendotrophic mycorrhiza with forest trees. *T. fumosum* was shown to form genuine mycorrhiza with a loose mantle and a Hartig network with aseptically grown pine seedlings. In some cases ectendotrophic mycorrhiza were found as well, although this species is also a strong cellulose-decomposer. The difference in cellulose-forming ability between litter-decomposing and mycorrhiza-forming types is probably quantitative rather than qualitative.

Köhler (E.). **Über das Vorkommen des Tabak-Ringfleckenvirus bei Kartoffeln.** [On the occurrence of Tobacco ring spot virus in Potatoes.]—*NachrBl. dtsch. PflSchDienst (Braunschw.)*, 2, 10, pp. 146–147, 4 figs., 1950.

A virulent strain of tobacco ring spot virus was recently detected attacking potato plants in Germany [*R.A.M.*, 20, p. 422]. The stems of the affected plants were markedly curved and shortened, and some varieties exhibited brown or black, healed wounds on the veins of the lower leaf surface and on the petioles. A marked feature is the frequent occurrence of healthy stems among the diseased ones, which are rapidly covered by the healthy so that the disease is often not readily noticed. It appears that the more extensive tobacco cultivation of recent years is responsible for the appearance of the more virulent virus strains.

In tobacco plants the symptoms are at first very pronounced, but the plants soon tend to recover and new growth appears quite healthy, although the virus remains present in low concentrations. Such masked plants may also be sources of infection.

Dr. Körner in an additional note states that since the end of the war tobacco ring spot virus has been observed occasionally in almost all potato varieties. Heavy attacks occurred only in plots from planting material increased in the vicinity of extensive allotments.

Black (L. M.). **Further studies on the properties of Potato yellow-dwarf virus.**—*Phytopathology*, 41, 3, pp. 213–220, 1951.

In studies at the Brooklyn Botanical Garden, New York, active potato yellow dwarf virus [*R.A.M.*, 27, p. 538; 29, p. 527] could no longer be detected in untreated juice from diseased *Nicotiana rustica* plants after a period varying from 2½ to 12 hours at room temperature, although at 0° C. neutralized juice was still highly infectious after storage for a week and partially purified concentrates after four weeks. The virus survived for one month in leaves at −14°. Inoculated leaves of *N. rustica* in the acutely and chronically infected stages and diseased stems were all rich sources of the virus. In a mean gravitational field of 50,000 × gravity, 90 per cent. or more of the virus was sedimented in about 10 mins. It is probably the largest virus studied by this method so far. The virus was most stable between pH6 and 9, and over a greater range on the alkaline side than on the acid. Ultra-centrifuged virus was readily filterable through Berkefeld N and W filters.

Mattingley (G. H.). **The seed Potato certification scheme.**—*J. Dep. Agric. Vict.*, 49, 4, pp. 177–180, 3 figs., 1951.

The following amendments have been made to the 1938 Seed Potato Certification Scheme for Victoria [*R.A.M.*, 23, p. 73; 28, p. 538]. Crops intended for certification must be at least one chain distant from any *Brassica* or potato crop not grown from certified seed. No crop grown on land planted with potatoes during the previous

four years will be accepted for certification unless the danger of virus infection from self-sown plants or plants of mixed origin has been eliminated. A limit of 5 per cent. virus-diseased plants and 5 per cent. of other diseases is allowed at the first inspection and 2 per cent. of each at the final (third) one. The maximum allowance of tubers damaged by disease for any consignment of certified seed is 10 per cent. for *Rhizoctonia* [*Corticium solani*], 5 per cent. common scab [*Actinomyces scabies*], 5 per cent. internal discoloration; and for blight [*Phytophthora infestans*], dry rot [*Fusarium caeruleum*], and [unspecified] wet rots, nil. In no case will a total of more than 10 per cent. diseased tubers be allowed; they will be considered as damaged if they bear a moderate scattering of *C. solani* sclerotia or three scattered scabs of *A. scabies*.

Hopkins (J. C. F.). **Diseases of fruit, flowers, and vegetables in Southern Rhodesia. 5. Diseases of Potatoes. (Revised).**—*Rhod. agric. J.*, 48, 1, pp. 19–33, 12 figs., 1951.

This paper on the causes, conditions contributing to, and control of potato diseases in Southern Rhodesia is a revised version of that published in 1941 [*R.A.M.*, 21, p. 216], incorporating information acquired since that date [cf. ibid., 27, pp. 117, 118; 28, p. 209]. Only one authentic outbreak of *Phytophthora infestans* on potato has been recorded locally [ibid., 26, p. 95], and that was confined to a few adjacent farms.

Pal (B. P.) & Pushkarnath. **Potato-breeding investigations in India.**—*Emp. J. exp. Agric.*, 19, 74, pp. 87–103, 2 pl., 1951.

Work on potato-breeding, carried out chiefly at the Simla branch of the Indian Agricultural Research Institute during the past 14 years, is summarized. About 40 hybrids have consistently shown high resistance to blight (*Phytophthora infestans*) [*R.A.M.*, 17, p. 59; 21, p. 2; 28, pp. 114, 160] under field and laboratory conditions. There is no evidence that physiologic forms of *P. infestans* are present in India. Resistance to potato leaf roll virus [ibid., 22, p. 398] was found in the Imperia variety and in an Indian commercial variety, Sathoo.

Bonde (R.). **Factors affecting Potato blackleg and seed-piece decay.**—*Bull. Me agric. exp. Sta.* 482, 31 pp., 9 figs., 1950.

In studies carried out in Maine on factors influencing the incidence of potato black leg [*Erwinia carotovora* and *E. atroseptica*: *R.A.M.*, 19, p. 427; 27, pp. 90, 119; 28, p. 417; 29, p. 276; 30, p. 340] and seed piece decay, seed tubers from 100 per cent. affected hills each year from 1926 to 1935 and in 1949 were placed in commercial storage and field planted the following year in Maine, Florida, New York, South Carolina, and New Jersey. The amount of black leg which resulted varied from 0 (six crops) to 10 per cent. (two).

Preliminary isolations from tubers with spotting due to *Phoma tuberosa* [ibid., 13, p. 495; 25, p. 526] yielded bacteria capable of causing black leg on artificial inoculation. Other studies proved that soft rot or black leg bacteria were present in the seed pieces affected by *P. tuberosa*. Freshly cut seed pieces were touched with discoloured and rotted material or cut with a knife used to cut tubers infected with *P. tuberosa*, and removed to moist chambers at 69° and 50° F. Bacterial decay was rapid and extensive at the higher temperature, but at 50° the pieces became only brown and discoloured. Two hundred pieces from this experiment were planted in the field; 2 per cent. of the diseased seed pieces gave small, foot-rotted plants and 15 per cent. produced typical black leg. The stems of 30 young potato plants were inoculated with bacterial soft rot material taken from seed pieces affected with *P. tuberosa* lesions; 17 developed typical black leg symptoms.

Two types of pathogenic bacteria, one causing a slow decay and the other a rapid soft rot, are commonly present as secondary organisms following infection

of potatoes by *Spongospora subterranea*. Similar bacteria were isolated from stored tubers affected by *Phytophthora infestans*. Seed piece spotting and decay and black leg are more general following years when blight (*P. infestans*) has been present, the fungus and the bacterial contamination being spread on the cutting knives. From the evidence obtained in soil studies the author is not convinced that black leg epidemics in Maine originate in soil contamination [ibid., 28, p. 306], but they may do so at Charleston, South Carolina. Most of the epidemics observed in the last 24 years have occurred where the cut seed tubers have been kept for some time before planting. The writer has never observed more than a trace of black leg in Maine when the seed was planted soon after being cut; experimental seed plots planted with freshly cut seed have remained free from apparent black leg for 25 consecutive years. Cut seed stored under cool, well-ventilated conditions seldom developed decay. Black leg was often associated with 'heating' of the cut seed in storage, and also developed from tubers with black heart [ibid., 28, p. 473]. Seed stocks injured by freezing developed high percentages of black leg. Disinfecting tubers and roguing did not give satisfactory control.

Hollis (J. P.). **Bacteria in healthy Potato tissue.**—*Phytopathology*, 41, 4, pp. 350–366, 1 diag., 1951.

At the Nebraska and Connecticut Agricultural Experiment Stations small numbers of many types of aerobic, heterotrophic bacteria were isolated from seed pieces and aerial stems of potato plants [*R.A.M.*, 28, p. 273] growing in peat and composted soil. The prevalence of the organisms in seed pieces and tubers was proportional to the degree of tissue vascularization, being greater in the former than in the latter in a given lot. Bacteria could not be isolated consistently from surface-sterilized potato seeds or from seedlings grown under sterile conditions. From the results of preliminary tests with *Pseudomonas tabaci* and *P. medicaginis* var. [f.sp.] *phaseolicola* [ibid., 30, p. 363] it appears that bacteria can enter the healthy potato plant by way of the root system.

Aerobacter cloacae was the predominant occupant of potato seed pieces and aerial stems, which also commonly yielded *Bacillus megatherium* [ibid., 28, p. 417], *B.* sp., and *Bacterium globuliforme*. *Bacillus megatherium* was the most frequent isolate from tubers and the most prevalent species common to all parts of the plant examined. The physiological characters of most of the bacteria in these studies resembled those described for isolates from the rhizospheres of certain plants [cf. ibid., 19, p. 422].

Du Toit (J. J.). **Pleospora herbarum (Pers.) Rabh. (conidial stage Stemphylium botryosum Wallr.) on Sweet Potatoes.**—*Sci. Bull. Dep. Agric. S. Afr.* 301, 47 pp., 24 figs., 2 diags., 4 graphs, 1951.

A severe rot of sweet potatoes from the Cape Flats, South Africa, occurred in storage at the Stellenbosch-Elsenburg College of Agriculture in 1945 and was found to be associated with leaf-spotting disease prevalent in the same area. Concentric, chocolate-brown patches develop on the living leaves, and the dead leaf stalks and vines bear numerous perithecia. Symptoms appear on the tubers one to three weeks after the crop has been lifted and stored, commencing as a soft, brown, moist rot at the site of injuries. Externally there is a faint, slightly depressed browning. The tissues gradually dry out and the tubers shrivel, become woody, and contain cavities. A soft, sour-smelling rot occurs when certain secondary organisms are also involved. On reddish-skinned varieties, such as Virovsky, the colour of the decayed parts may vary from red to purple-brown. Isolations from diseased tubers, leaves, petioles, and vines yielded *Pleospora herbarum*, a detailed study of which was made. Its pathogenicity was established in inoculation

experiments. The fungus was capable of infecting only injured tubers. Storage for five to eight days at about 20° C. and 90 per cent. humidity followed by cooler conditions (8°) and lower humidity (86 per cent.) greatly reduced breakdown losses from this fungus. The preliminary period of high temperature and humidity appears to favour the development of protective layers.

Martin (W. J.) & Person (L. H.). **Surface rot of Porto Rican Sweet Potatoes.**—*Phytopathology*, 41, 3, pp. 228–230, 2 figs., 1951.

A surface rot of sweet potatoes (variety Porto Rico) during and after storage, distinct from that reported on other varieties, has become increasingly important in certain parts of Louisiana during recent years. The approximately circular lesions, one or two per potato, increase from minute size to 3 in. or more in diameter after a few months' storage. The decay usually extends deeper than the vascular ring and may resemble the lesions caused by black rot (*Ceratostomella fimbriata*) [*R.A.M.*, 30, p. 190]. No shrivelling occurred. Isolations, however, consistently yielded a *Fusarium* sp.; in pathogenicity tests these isolates were relatively innocuous to young sweet potato roots, but when inoculated potatoes were put in commercial storage typical lesions developed after 40 to 60 days. Small root lesions were evident on plants grown in heavily inoculated soil. No stem rot developed in inoculated sweet potatoes, nor did the stem rot organisms (*F. batatatis*) [*F. bulbigenum* var. *batatas*: ibid., 30, p. 387] and *F. hyperoxysporum* [*F. oxysporum* f. 2: ibid., 28, p. 418] cause surface rot.

Wilcox (Marguerite S.) & Ezell (B. D.). **Storage temperature and the development of internal cork in Sweet Potatoes.**—*Phytopathology*, 41, 5, pp. 477–479, 1951.

At the Plant Industry Station, Beltsville, Maryland, Porto Rico sweet potato roots which were free from internal cork symptoms [*R.A.M.*, 30, p. 244] at harvesting on 4th October showed 64·8 per cent. infection by the following 24th May at a storage temperature of 70° F. At the last inspection on 26th July there was 10·7 per cent. infection in a lot stored at 55°. At the higher temperature many of the spots had coalesced to form large, corky areas in the roots. It would appear from these data that storage at the unfavourable temperature of 70° facilitates the appraisal of susceptibility to internal cork and the presence of the virus in a latent form.

Szirmai (J.). **Le 'brusone' du Riz et ses aspects particuliers en Hongrie.** ['Brusone' of Rice and its particular aspects in Hungary.]—*Acta agron. Acad. sci. hung.*, 1, 1, pp. 160–196, 11 figs., 1950. [Russian summary.]

This is an expanded account of the author's studies on the two forms of the 'brusone' disease of rice occurring in Hungary, one associated with *Piricularia oryzae* and the other with *Pseudomonas* sp., a summary of which from another source has already appeared [*R.A.M.*, 29, p. 582].

Malaguti (G.). **Enfermedades del Arroz en Venezuela. I. Primera contribución.** [Diseases of Rice in Venezuela. I. First contribution.]—*Bol. Minist. Agric. Venez.* 4, 40 pp., 20 figs., 1950. [English summary.]

Rice diseases occurring in Venezuela, besides blast (*Piricularia oryzae*) and helminthosporiosis (*Helminthosporium oryzae*) [*Ophiobolus miyabeanus*: *R.A.M.*, 30, p. 74], comprise kernel discoloration, commonly associated with *Curvularia* sp., *O. miyabeanus*, *Alternaria* sp., and *Penicillium* sp.; various forms of sterility [ibid., 25, p. 472], including straighthead [ibid., 24, p. 472]; and sheath spot, caused by a *Rhizoctonia* referred by T. C. Ryker to the *Hypochnus* [*Corticium*] *sasakii* strain of the *R.* [*C.*] *solani* group [ibid., 17, p. 623; 27, p. 447].

Padwick (G. W.). **Manual of Rice diseases.**—viii+198 pp., 48 figs., Commonwealth Mycological Institute, Kew, Surrey, 1950. 30*s*.

After a preface stressing the importance of the rice crop and the necessity of using every possible means of increasing production, the author presents his data in three parts: I, diseases of parasitic origin (115 pp.); II, non-parasitic diseases (17 pp.); and III, an annotated check-list of the fungi recorded on rice (57 pp.). Part I is divided into diseases of foliage, of stem and leaf sheath, seedling blights and foot rot, diseases of the grain and inflorescence, and those caused by nematodes. Part II includes diseases caused by unfavourable soil conditions, deficiency disorders, and virus diseases. The more important fungous diseases are dealt with under history, symptoms, descriptions of the causal fungi, notes on biology, physiology, races if known, varietal resistance, and control. The author has gone through the extensive literature, examined most of the papers published on rice diseases, and checked the citations and descriptions of the numerous fungi recorded on rice. The book thus presents a comprehensive survey of the present knowledge regarding the diseases of this important crop, supplemented by personal observations made in India, America, Ceylon, and elsewhere.

Uribe Henao (A.). **Aspectos técnicos en la producción de Caucho Hevea.** [Technical aspects of *Hevea* Caoutchouc production.]—*Rev. Fac. Agron. Medéllin*, 11, 40, pp. 151–244, 21 figs., 1950.

Included in this useful, fully documented survey of the technical aspects of rubber production from *Hevea* in Colombia and other Latin-American countries is a section (pp. 220–227) on some of the major world diseases of the crop.

Sharma (O. P.) & Mahmud (K. A.). **A leaf rot of Mentha viridis Linn. caused by Rhizoctonia solani Kuhn.**—*Mag. agric. Coll. Nagpur*, 25, 3–4, p. 23, 1951.

A progressive leaf rot of *Mentha viridis* [*M. spicata*] due to *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, 17, p. 507] was observed at Nagpur, India, during July, 1948.

Askew (H. O.) & Monk (R. J.). **Boron in the nutrition of the Hop.**—*Nature, Lond.*, 167, 4261, pp. 1074–1075, 1 fig., 1951.

In the dry 1950–1 season the growth of hop plants in New Zealand was very unsatisfactory. There was great delay in the development of new shoots, accompanied by crinkling and often malformation of the leaves. Shoots showed short internodal spacing, early development of secondary laterals, and dying of the growing point. The incidence varied from garden to garden, but some of the symptoms were present in most cases. Certain rows of hop plants in two gardens, which had been treated in 1948 with borax ($\frac{1}{2}$ oz. per hill), were healthy in the 1950–1 season, indicating that the trouble was due to boron deficiency. Healthy young shoot samples from Wai-iti and Tadmor contained, respectively, 50·4 and 34·2 p.p.m. boron, while the unhealthy had only 7·5 and 9·5 p.p.m., respectively. It appears that for healthy growth hop shoots should contain not less than 20 p.p.m. of boron in the dry matter.

Savile (D. B. O.). **Peronospora stigmaticola in Canada.**—*Mycologia*, 43, 1, pp. 113–114, 1951.

Peronospora stigmaticola was identified on the stigmas and filaments of a specimen of *Mentha arvensis* var. *villosa* from Prince Edward Island in August, 1950. The fungus was also found on herbarium material of *M. arvensis* var. *villosa* f. *glabrata* from Ontario (September, 1947). These appear to be the first records of *P. stigmaticola* from North America.

Proceedings Specialist Conference in Agriculture. Plant and Animal Nutrition in Relation to Soil and Climatic Factors.—x+490 pp., 4 diags., 2 maps, 31 graphs, London, H.M. Stationery Office, 1951. £1 net.

This volume contains 71 papers presented at the specialist conference held in Adelaide and Canberra from 22nd August to 15th September, 1949. The titles of those dealing with mineral deficiencies are 'The diagnosis of the mineral status of plants, with special reference to deficiencies, excesses, and interactions of nutrient elements' by T. Wallace (pp. 100–113) [*R.A.M.*, 27, p. 42; 29, p. 313; 30, p. 233]; 'The interaction of factors in determination of plant yield' by F. G. Gregory (pp. 114–123); 'Some aspects of boron deficiency in plants' by H. O. Askew (pp. 125–129), in which the function of boron in plants, the conditions governing its availability, and some of the problems still requiring investigation are surveyed; 'Boron in Canadian agriculture' by C. G. Woodbridge (pp. 129–136) [ibid., 30, p. 75]; 'Manganese and copper deficiencies in the south coastal region of South Africa' by I. S. Perold (pp. 136–144) [ibid., 28, p. 511]; 'Molybdenum deficiency diseases of vegetable crops in the central coast area of New South Wales' by R. D. Wilson (pp. 155–156) [ibid., 29, p. 407; 30, p. 136]; 'Magnesium deficiency in Canadian crop production' by F. B. Johnston (p. 156) [ibid., 29, p. 55]; and 'Influence of light and temperature on nutrient uptake and use, with particular reference to zinc' by Helen M. Ferres (pp. 240–243).

Fertilizer experiments on the Cape Flats in South Africa have shown that vegetable production is limited by manganese deficiency. For potatoes, peas, beans [*Phaseolus vulgaris*], and tomatoes 25 lb. manganese sulphate per acre or a spray application at 0·25 per cent. (7½ lb. per acre) proved adequate. In the fifth year the amendment could be omitted, owing to the residual effect.

At the Waite Agricultural Research Institute, Australia, experiments with flax, subterranean clover, and red clover showed that zinc uptake is influenced by air temperature and the length of the light period, the latter factor also influencing the distribution of the element in the plant [ibid., 29, p. 612]. Augmenting zinc content by soil amendments or by increasing the temperature or light duration also raised yields.

Edgerton (C. W.). **Forty-two years of Sugarcane disease research at the Louisiana Agricultural Experiment Station.**—*Bull. La agric. Exp. Sta.* 448, 31 pp., 2 graphs, 1950.

The author reviews briefly the results obtained from investigations carried out from 1908 until 1950 by the Department of Botany, Bacteriology, and Plant Pathology of Louisiana State University and the Louisiana Agricultural Experiment Station on diseases of sugar-cane, other investigations being mentioned in so far as they have a bearing on the subject. Work at present in progress is also discussed, and problems still requiring elucidation are touched on. The more important publications issued by the Department during the same period are listed.

Hutchinson (P. B.) & Dale (W. T.). **A serious Sugar-Cane disease in British Guiana.**—*Nature, Lond.*, 167, 4259, p. 998, 1951.

A sugar-cane disease with symptoms resembling leaf scald (*Xanthomonas albilineans*) [C.M.I. map No. 33; *R.A.M.*, 30, p. 78] occurs throughout British Guiana, causing heavy losses. The widely grown varieties B. 34104 [ibid., 30, p. 246] and D. 14/34 are affected both as plants and ratoons.

Baker (R. E. D.) & Dale (W. T.). **Fungi of Trinidad and Tobago.**—*Mycol. Pap., Commonw. mycol. Inst.*, 33, 123 pp., 4 col. pl., 44 figs., 1 map, 1951.

In this annotated, systematic list of fungi collected in Trinidad and Tobago, chiefly during the past five years, previous lists [*R.A.M.*, 11, p. 474; 17, p. 270;

20, p. 426] and published records are brought together and many new ones incorporated. Attention is focused on the Uredinales, Polyporaceae, Agaricaceae [cf. ibid., 30, p. 194], Meliolineae, Phyllachoreae, and the genus *Cercospora*. The majority of the collections are deposited in the mycological herbarium of the Imperial College of Tropical Agriculture. A host-fungus index is provided.

Wallace (G. B.) & Wallace (Maud M.). **Tanganyika fungus list : recent records No. XIV.**—*Mycol. Circ. Dep. Agric. Tanganyika* 29, 6 pp., 1950. [Mimeographed.]

New fungus records for Tanganyika reported in this circular [cf. *R.A.M.*, 30, p. 79] include *Ustilago nuda* on barley [cf. ibid., 16, p. 244; 26, p. 216], *Fomes noxius* [cf. ibid., 29, pp. 99, 236] and *Helicobasidium compactum* [cf. ibid., 25, p. 234; 27, p. 260] associated with root rot of *Chlorophora excelsa* trees and seedlings, respectively, *Colletotrichum trifolii* on lucerne [cf. ibid., 17, p. 44], *Cephalosporium acremonium* [cf. ibid., 10, p. 513] on maize seed, *Alternaria carthami* on safflower [cf. ibid., 24, p. 71], and *Puccinia antirrhini* on *Antirrhinum majus* [C.M.I. map No. 40].

Helminthosporium helianthi was severe on sunflowers [*R.A.M.*, 23, p. 409] at Morogoro in 1950, while rust [*P. helianthi*: C.M.I. map No. 195] started early in the Northern Province and was also severe.

Cummins (G. B.). **Uredinales of continental China collected by S. Y. Cheo. I.**—*Mycologia*, 42, 6, pp. 779–797, 10 figs., 1950.

This annotated list of rusts collected in continental China [*R.A.M.*, 30, p. 289] by S. Y. Cheo [cf. ibid., 28, p. 247 and next abstract] includes 16 new to China and six new species. *Melampsora aleuritidis* n.sp. occurs on *Aleurites* sp., *Phakopsora malloti* n.sp. on *Mallotus* sp., *P. fici-erecti* on *Ficus* sp. [cf. ibid., 17, p. 841] and white mulberry, *P. cheoana* n.sp. on *Cedrela sinensis*, *Coleosporium violae* n.sp. on *Viola limprechtiana*, and *Hamaspora hashiokai* [ibid., 15, p. 57] on *Rubus* sp.

Cummins (G. B.). **Uredinales of continental China collected by S. Y. Cheo. II.**—*Mycologia*, 43, 1, pp. 78–98, 11 figs., 1951.

This second contribution to the present series [see preceding abstract] includes a number of new species and the following new records from continental China: *Uromyces lepodermus* on *Setaria* sp. [*R.A.M.*, 5, p. 657], *Puccinia pygmaea* [cf. ibid., 13, p. 655] on *Calamagrostis arundinacea*, *P. oahuensis* on *Digitaria* sp., *P. rufipes* on *Imperata cylindrica*, and *Uredo tholopsora* n.sp. on poplars (*Populus nigra*, *P. tomentosa*, and *P.* sp.).

Savile (D. B. O.) & Conners (I. L.). **The rusts of Armeria and Limonium in North America.**—*Mycologia*, 43, 2, pp. 186–195, 1951.

Uromyces armeriae is divided into the following well-defined subspecies; *U. armeriae* ssp. *armeriae* n.nom. (type subspecies) on *Armeria maritima* and its varieties *elongata* and *purpurea* in Europe, ssp. *hudsonicus* n.ssp. on *A. maritima* var. *labradorica* on the coast of Hudson Bay, and ssp. *pacificus* n.ssp. on *A. maritima*, wild and cultivated, and its var. *californica* on the Pacific Coast of North America. *U. limonii-carolinianae* n.sp. on *Limonium carolinianum* from different parts of eastern Canada and Mississippi is distinguished from *U. limonii* [*R.A.M.*, 30, p. 195] on other *Limonium* spp. in lacking uredia, producing aecidia throughout the summer, and having slightly longer teleutospores and pedicels.

Keener (P. D.). **An ascigerous stage of Darluca filum (Biv.) Castagne.**—*Plant Dis. Reptr*, 35, 2, pp. 86–87, 1 fig., 1951. [Multilithed.]

A fungus found in the ascigerous and conidial states colonizing sori of *Puccinia*

extensicola-oenotherae on *Carex* sp., of *P. obscura* on *Luzula* sp., and *Frommea obtusa* on *Potentilla canadensis* agreed morphologically with the descriptions of *Eudarluca australis* [*R.A.M.*, 27, p. 158]. The connexion between the *Eudarluca* and *Darluca filum* phases was established by cultural techniques. The question is raised as to the necessity for re-characterizing the genus *Eudarluca*, and for the possible adoption of *E. australis* as the correct binomial.

Diehl (W. W.). **Balansia and the Balansiae in America.**—*Agric. Monogr. U.S. Dep. Agric.* 4, 82 pp., 11 pl., 5 figs., 1 diag., 10 maps, 1950.

This important monograph on *Balansia* and the Balansiae [cf. *R.A.M.*, 10, pp. 389, 450; 14, p. 794; 26, p. 28] in North and South America, based on field observations, cultural studies, and the examination of herbarium material, deals with the morphological basis for the taxonomy of the genus *Balansia* (including the mycelium and the hypothallus, the conidial fructification, the ephelidial stage, the ascostroma, the sequence of fructifications, and the concept of the genus), the taxonomic position of *Balansia* and related genera, systematics, host relations in the Balansiae (including host specificity, teratology, mode of infection and dissemination, incidence, epidemiology, and control, susceptibility, and recovery from infection), climatic factors and geographical distribution, and economic considerations. A seven-page, double-column bibliography is appended, with a host index and an index of fungus names.

The author deals with 14 species of *Balansia* (including two new ones), one of *Atkinsonella* n.gen., namely, *A. hypoxylon* n.comb. (formerly *Epichloë hypoxylon*) and its var. *texensis* n.var., three of *Balansiopsis*, and some excluded species. Several new combinations are made. Grasses and sedges are affected, but the pseudomorphs are not poisonous to animals [cf. ibid., 14, p. 630] or man.

Hughes (S. J.). **Brachysporium in Britain.**—*Naturalist, Leeds, 1951*, pp. 45–48, 1 fig., 1951.

An emended description of the genus *Brachysporium* [*R.A.M.*, 17, p. 337] is given with *B. obovatum* (Berk.) Sacc. as lectotype. Five British species, two of them new, are described and illustrated: all were collected on dead wood or bark.

Cook (M. T.). **Species of Synchytrium in Louisiana. VI. Two new species on Impatiens and Smilax.**—*Mycologia*, 43, 1, pp. 103–107, 12 figs., 1951.

Descriptions are given of *Synchytrium impatientis* n.sp. on *Impatiens pallida* and *I. biflora*, and of *S. smilacis* n.sp. on *Smilax* spp., both from Louisiana [cf. *R.A.M.*, 28, p. 423].

De Jong (P.). **The use of seed dressings in the control of fungus diseases of Tea seed.**—*Plant. Chron.*, 46, 4, pp. 91–92, 1951.

Tea seed on South Indian estates often fails to germinate owing to infection by species of *Fusarium*, and less commonly by a species of *Diplodia* [*R.A.M.*, 20, p. 498] and *Colletotrichum camelliae* [*Glomerella cingulata*: ibid., 29, p. 57]. In a trial in December, 1950, at the Nonsuch Tea Estate, tea seed was treated with fernasan and agrosan GN in dust form at the rate of 4 oz. per maund (82 lb.) seed and the latter also as a liquid (8 oz. per 10 gals. water). Fungal infection was not present, but the seed treated with fernasan germinated more rapidly than that treated with agrosan GN or the untreated. After two months 90 per cent. of the treated seed had germinated compared with 30 per cent. of the untreated. Cost of material is calculated at probably Rs. 2 per maund of seed for fernasan, and 6 annas for agrosan GN.

Chessin (M.). **The effects of nitrogen deficiency on the properties of Tobacco-mosaic virus.**—*Phytopathology*, 41, 3, pp. 235–237, 1951.

Studies were made at the Montana State University, Missoula, to determine the effect of nitrogen deficiency on particle size and infectivity of tobacco mosaic virus [*R.A.M.*, 21, p. 169]. Turkish tobacco seedlings grown aseptically in a complete nutrient solution were inoculated with the virus when 6 in. high, one half being transferred to a nitrogen-deficient solution ten days later. In a second series seedlings were transferred to the nitrogen-deficient solution when 10 in. high and ten days later inoculated with the virus. The inoculated leaves were harvested after 20 days in the first group and after 14 in the second.

Electron micrographs revealed no significant difference between the size of the virus particles in each group. Assays on Early Golden Cluster bean (*Phaseolus vulgaris*) and *Nicotiana glutinosa* showed that the infectivity of the purified virus from the nitrogen-deficient tobacco plants was reduced towards bean, but no consistent reduction towards *N. glutinosa* was apparent.

Holmes (F. O.). **Indications of a New-World origin of Tobacco mosaic virus.**—*Phytopathology*, 41, 4, pp. 341–345, 1 map, 1951.

Most of the 12 contributions to the literature on the geographical distribution of tobacco mosaic virus cited in this presentation of evidence for the New World origin of the disease have already been noticed in this *Review*. The data advanced in support of the hypothesis are based on a study of solanaceous plants, with special reference to the crops chiefly affected, viz., tobacco, chilli, and tomato. The geographical areas, where relatively resistant species and varieties of generally susceptible groups are found, are compared with regions in which closely related but highly susceptible species are common.

Smith (P. G.) & Gardner (M. W.). **Resistance in Tomato to the spotted wilt virus.**—*Phytopathology*, 41, 3, pp. 257–260, 1 graph, 1951.

This is a full acount of work carried out at the University of California on the inheritance of resistance to the tomato spotted wilt virus, a preliminary announcement of which has already been noticed [*R.A.M.*, 28, p. 252].

Giddings (N. J.), Bennett (C. W.), & Harrison (A. L.). **A Tomato disease resembling curly top.**—*Phytopathology*, 41, 5, pp. 415–417, 1 fig., 1951.

A disease of tomatoes in the Bradenton district of Florida closely resembling [beet] curly top [*R.A.M.*, 29, p. 127 and next abstract] proved to be readily transmissible by graft (but not by juice) inoculation to its own host, the Jubilee variety of which was slightly more susceptible than Pearson and Golden Ponderosa. Mild symptoms also developed on *Datura stramonium* and *Lycopersicon hirsutum* grafted with scions from diseased tomato. Vein-clearing was the most conspicuous feature in any of the test plants. Tomato plants from three localities in Texas with symptoms like those of the Florida disease yielded the beet curly top virus. The identity of the Florida virus awaits confirmation by transmission studies other than grafting.

Lackey (C. F.). **Histological studies of a Tomato disease resembling curly top.**—*Phytopathology*, 41, 5, pp. 418–419, 1 fig., 1951.

Transverse sections, stained with iron-haematoxylin and counter-stained with safranin and light green in clove oil, through the vascular ring of a greenhouse tomato stem affected by a disease resembling [beet] curly top [see preceding abstract] revealed abnormal production of the phloem tissue at irregular intervals, pronounced hypertrophy of the phloem parenchyma, and extensive disorganization

of the vascular ring, but none of the severe necrosis or degeneration characteristic of severe curly top. The foliar vein distortion of plants infected by curly top virus and the similar new disease are caused by abnormal stimulation in parenchyma cell growth, as well as hypertrophy of this tissue. Unlike curly top, however, the recently observed disease does not induce necrosis of the leaf phloem tissue.

GERDEMANN (J. W.) & FINLEY (A. M.). **The pathogenicity of races 1 and 2 of Fusarium oxysporum f. lycopersici.**—*Phytopathology*, 41, 3, pp. 238–244, 1951.

Studies were made from 1944 to 1946 in the Department of Botany, University of Missouri, on physiologic specialization in the tomato wilt organism, *Fusarium oxysporum* f. *lycopersici* [*F. bulbigenum* var. *lycopersici*: *R.A.M.*, 24, p. 434; 27, p. 121]. Two races, designated 1 and 2, were isolated from both naturally and artificially infected commercial varieties and hybrids of tomato × *Lycopersicon pimpinellifolium*. Race 1 was practically non-pathogenic to plants possessing the *L. pimpinellifolium* resistance factor, and pathogenic to those lacking it. Race 2 was pathogenic to both groups.

The qualitative nature of the difference in pathogenicity between the two races, the absence of intermediate types, and the fact that race 2 isolates were obtained from resistant hybrids grown in field plots known to be infested with race 1, indicate that there is a one-step transition between the two races. Pathogenicity tests with re-isolates of race 1 cultures from the resistant hybrid S–39 indicated that changes in pathogenicity are not brought about by adaptation.

WILSON (J. D.) & RUNNELS (H. A.). **Tomato anthracnose. Comparative susceptibility of varieties and their response to spraying.**—*Res. Bull. Ohio agric. Exp. Sta.* 685, 22 pp., 1 fig., 1949.

Experiments carried out in Ohio from 1944 to 1947 inclusive on the control of tomato anthracnose (*Colletotrichum phomoides*) and on varietal resistance to the disease [*R.A.M.*, 28, p. 599; 30, pp. 8, 52, 437] showed that fruits on plants of determinate growth developed more infection than those on indeterminate plants. The average percentage of infection was 35·8 on seven varieties of the former type and only 10·8 on seven of the latter. Spraying the determinate varieties with zerlate decreased anthracnose by 85 per cent. and increased the yield of usable fruit by 71 per cent. The average percentage infection on seven early varieties was 38, and on seven late ones only 15.

On seven varieties with open growth and sparse foliage 28 per cent. of the fruits were affected, though the average figure was 18 for seven other varieties with a more compact habit and denser foliage. Spraying increased the yield by 66 per cent. in the former group and by 45 per cent. in the latter. The average percentage fruit infection on 14 varieties which were almost completely defoliated by 15th September was 37, as against 17 in varieties which retained their foliage longer. Little or no correlation was established between fruit susceptibility to anthracnose and its resistance to mechanical puncture.

In 1947, 30 varieties were compared for susceptibility to anthracnose and, incidentally, to blight [*Phytophthora infestans*]. Spraying at seven weekly intervals with zerlate reduced anthracnose by about 90 per cent., blight by 72 per cent., and cull fruits by about 64 per cent.; the total number of fruits set was increased by 11 per cent., and the total yield and yield of usable fruit by 30 and 95 per cent., respectively. Long Red, Early Baltimore, OSU 3, and 100 Certified had the least anthracnose fruit infection (6 to 8 per cent. on the unsprayed), while Quebec, Long Red, 651, Bounty, and Earliana and its hybrids had the least late blight, but the last three are very susceptible to anthracnose. Of five commercial processing varieties, Garden State developed most anthracnose, followed in descending order by Cobourg, Stokesdale, Rutgers, and Baltimore. Garden State also displayed the

greatest increase in infection as the season advanced and the most favourable response to zerlate spraying.

BORDERS (H. I.). **Tests of fungicides for the control of Tomato plant diseases in South Georgia, 1949-1950.**—*Plant Dis. Reptr*, 35, 2, pp. 98–101, 1951. [Multilithed.]

In 1949 spraying tests in south Georgia for the control of *Alternaria* blight (*A. solani*) [*R.A.M.*, 29, pp. 439, 499] Rutgers tomato transplants were set out on 7th June and applications made at seven-day intervals from 28th June to 9th August. The disease appeared at the end of July and by the first week in August untreated plants were severely infected. The best control was achieved with dithane D–14 at 2 qts. per 100 gals. plus zinc sulphate (1 lb.) and lime ($\frac{1}{2}$ lb.), with 6·04 per cent. infected leaflets on 11th August, followed by zerlate (2 lb.) with 6·52 per cent.; the untreated had 97·87 per cent. infection.

In 1950 applications of dusts and sprays on Rutgers were made at seven-day intervals from 13th June to 25th July. The disease was again severe towards the end of the test and the controls and those treated with the poorer fungicides were almost completely destroyed by the 1st August (100 per cent. infection). Sprays with dithane D–14 plus zinc sulphate and lime, zerlate, dithane Z–78 (2 lb. per 100 gals.), and tribasic copper sulphate (4 lb.) were the most effective, with 13, 28, 32, and 41 per cent. of infected leaflets.

FOWLER (M. E.). **Surveys for Oak wilt.**—*Plant Dis. Reptr*, 35, 2, pp. 112–118, 1 fig., 2 maps, 1951. [Multilithed.]

In 1950 willow oak (*Quercus phellos*) and southern red oak (*Q. rubra*) were found for the first time naturally infected with oak wilt (*Chalara quercina*) [*R.A.M.*, 29, p. 606; 30, pp. 252, 312]. Aeroplane surveys in southern Missouri [ibid., 29, p. 544], northern Arkansas, and in western Kentucky and Tennessee revealed that the disease is spreading actively in southern Missouri; several new infection centres were discovered and the disease is definitely established in 19 additional counties of the State. It was found in six counties in Arkansas, infections being not more than three years old. The southernmost confirmed cases were in Logan county. Other investigators detected the disease for the first time in one county in Nebraska, three counties in Ohio, and one county each in Pennsylvania and Kansas [see next abstract]. Until more is known about the spread of the pathogen, control measures should include burning diseased trees, poisoning healthy ones around the perimeter of infected trees with sodium arsenite or ammate, and mechanical severance of roots connecting diseased and healthy trees by 30-in. deep cuts.

SHIELDS (I. J.). **Oak wilt in Kansas.**—*Plant Dis. Reptr*, 35, 2, p. 119, 1951. [Multilithed.]

Chalara quercina [see preceding abstract] was isolated in 1950 from dead and dying *Quercus stellata* trees in Douglas county, Kansas, this being the first record of the disease in the State. No evidence of the disease was detected in 30 other counties surveyed.

DAVIDSON (R. W.). **Urnula craterium is possibly the perfect stage of Strumella coryneoidea.**—*Mycologia*, 42, 6, pp. 735–742, 3 figs., 1950.

In December, 1948, isolations from the inner bark tissue of an oak log (cut during 1946 near Fairfax, Virginia), bearing peculiar, finger-like fungus growths, yielded in 10 cases out of 12 what appeared to be cultures of *Strumella coryneoidea* [*R.A.M.*, 30, p. 217]. Additional sections of oak logs containing immature fruiting bodies of the fungus were collected and by 25th April, 1949, mature sporophores of *Urnula craterium* had developed.

Cultures on malt agar, with or without gallic or tannic acid, of *S. coryneoidea* from cankers and *U. craterium* from bark or sporophore tissue were similar. They grow rapidly, forming a pale grey, dense mat. Old cultures develop dark, sometimes black, areas. In test tube cultures rather dense, black stromatic masses of fungus tissue develop between the glass and the agar. The growth rate of both fungi on 2 per cent. malt agar at 24° C. was about 50 to 60 mm. in one week, while with the addition of gallic or tannic acid it was 0 to 20 and 20 to 30 mm., respectively. Both fungi reacted strongly to these acids [cf. ibid, 18, p. 360].

On 8th December, 1949, additional material of *Urnula* was collected on a canker control plot near Oakland, Maryland, where *Strumella* cankers are abundant on oak. The cankered trunks contained many young sporophores of *Urnula*. Evidently these begin to develop in the autumn, apparently only on trunks that have been lying on the damp ground for some time. These observations strongly suggest that *U. craterium* is the perfect state of *S. coryneoidea*. In timber stand improvement work to reduce canker incidence felled trees with *Strumella* cankers should not be left on the ground.

Günther. **Pappelschädlinge und ihre Bekämpfung.** [Poplar pests and their control.] —*Forstw.-Holzw.*, 4, 13, pp. 195–200, 2 figs., 1950.

This paper is chiefly concerned with insect pests of poplars in Germany, but mention is made of an epiphytotic of canker (*Cytospora*) [(?) *chrysosperma* stat. conid. [*Valsa sordida*: *R.A.M.*, 30, p. 293] which decimated the nursery of the Forestry Research Station, Graupa, Dresden, only *Populus trichocarpa* and *P. berolinensis* remaining immune. The outbreak was favoured by the enforced neglect of the customary silvicultural practices resulting from war and post-war difficulties.

Caroselli (N. E.) & Feldman (A. W.). **Dutch Elm disease chemotherapy with carolate and related formulations.**—Abs. in *Phytopathology*, 41, 1, p. 6, 1951.

Carolate (low-magnesium lime, salicylate, and urea) [*R.A.M.*, 30, p. 252], with or without an azo dye, has been compared with related formulations for the control of Dutch elm disease (*Ceratostomelli ulmi*) on over 2,000 wood-lot and estate trees during the past three years. When wood-lot elms were inoculated with the fungus [ibid., 30, p. 350] after soil application of the compound by hydraulic impregnation, the disease was arrested in about 70 per cent. of the trees for more than two years. The host responds to the treatment by the formation of a broad annual ring circumscribing the discoloured tissue. *C. ulmi* can be isolated from trees treated with carolate three years previously, indicating that the compound itself is not fungicidal *in vivo*, though the azo dye and salicylate kill the pathogen at 1 in 1,000 and inhibit toxin production at 1 in 50,000. Severe trunk injury to trees treated and inoculated two or three years earlier caused fresh outbreaks of the disease in 70 per cent. of the trees given low-magnesium lime plus urea, and in 40 and 18 per cent. of those treated, respectively, with the same combination plus azo dye and with carolate. Records on 1,100 estate elms treated with carolate show 40 per cent. mortality when less than 5 per cent. wilt was present at the time of application and 79 per cent. when the incidence of the disease exceeded this level.

Bonar (L.). **Two new fungi on Torreya.**—*Mycologia*, 43, 1, pp. 62–66, 5 figs., 1951.

Two new species of fungi are described on *Torreya californica* in California. *Caeoma torreyae* n.sp. produces amphigenous, scattered, subepidermal, subglobose, paraphysate spermogonia, measuring 130 to 185 μ high and 100 to 130 μ wide, on the current season's leaves, especially on young plants. The hypophyllous, usually confluent, subepidermal, erumpent aecidia form white, occasionally interrupted lines and measure up to 3 cm. long by 0·5 to 0·7 mm. wide. There is no peridium.

The broadly ellipsoid to globose, subangular aecidiospores measure 15 to 20 (25) by 9 to 12 μ, and have a finely verrucose, colourless wall 1 to 1·5 μ thick. *Clasterosporium obclavatum* n.sp. develops solitary, acrogenous, abruptly obclavate, fuscous, 5- to 13-septate conidia constricted at the septa and measuring 54 to 72 by 8·5 to 12 μ on second- and third-year leaves; the distal portion is attenuated and pallid, and darkens with age.

Buchanan (T. S.), Harvey (G. M.), & Welch (D. S.). **Pole blight of Western White Pine : a numerical evaluation of the symptoms.**—*Phytopathology*, 41, 3, pp. 199–208, 2 diags., 1951.

In studies at the School of Forestry, University of Idaho, detailed dissections of 50 western white pine trees [*Pinus monticola*] disclosed that the one symptom specific to pole blight [*R.A.M.*, 29, p. 282; 30, p. 351] was streaks of dead cambium, generally a few inches wide and extending several feet along the main pole. Unexplained resinosis and flat faces on the pole were reliable indicators of dead cambium beneath. Readily measured crown symptoms, which were positively correlated with the girdling effect of the dead cambial streaks, formed the basis of a reliable symptom pattern for field use. The reliable expressions of pole blight severity, i.e., unexplained internodal resinosis and dead areas on the main bole, or flattened areas not directly associated with root crotches, the length of the last complete year's internode on the leader, the overall aggregate length of needle-bearing stem on the leader and upper crown branches, the length and colour of needles in the upper crown and its density, were used for assigning a numerical index from which the severity of pole blight on each tree could be assessed. Each of these symptoms is given a rating according to its severity and a simple summation of these values gives the numerical index for the tree: 0 to 0·5, apparently healthy; 0·6 to 2, probable early pole blight; 2·1 to 3, definite pole blight; 3·1 to 3·6, severe pole blight; and 4, tree dead. The total individual indices for all trees on a plot divided by the number of trees examined gives a figure indicating the condition of the stand as a whole.

Struckmeyer (B. Esther) & Riker (A. J.). **Wound-periderm formation in White-Pine trees resistant to blister rust.**—*Phytopathology*, 41, 3, pp. 276–281, 9 figs., 1951.

Studies were made at the University of Wisconsin on the anatomy of the wound periderm associated with the resistance to blister rust (*Cronartium ribicola*) [*R.A.M.*, 30, p. 143] in certain selected white pine trees [*Pinus monticola*]. When resistant trees became infected a cork cambium developed in the stems, forming a wound periderm which prevented the fungus from penetrating farther into the tissues. Several layers of cork cells and heavily lignified stone cells were differentiated alternately outside the cork cambium; cork parenchyma was formed internally. In less resistant trees the fungus penetrated into the phloem parenchyma and ray cells before a cork cambium was formed, while in those even less resistant the fungus reached the cambium. Cambial and ray cells extending from the xylem developed a callus, composed primarily of meristematic cells with some cork cells on the surface, which grew over the injured area. No wound periderm was observed in susceptible trees.

White-Pine blister rust. Administrative instructions designating control areas.—U.S.D.A., B.E.P.Q., 546, 1st Revision, 18 pp., 1950. [Mimeographed.]

These revised administrative instructions concerning movements of plants susceptible to white pine blister rust [*Cronartium ribicola*] in the United States became effective as from 14th August, 1950, and supersede B.E.P.Q. 546 of 1946 [*R.A.M.*, 26, p. 128].